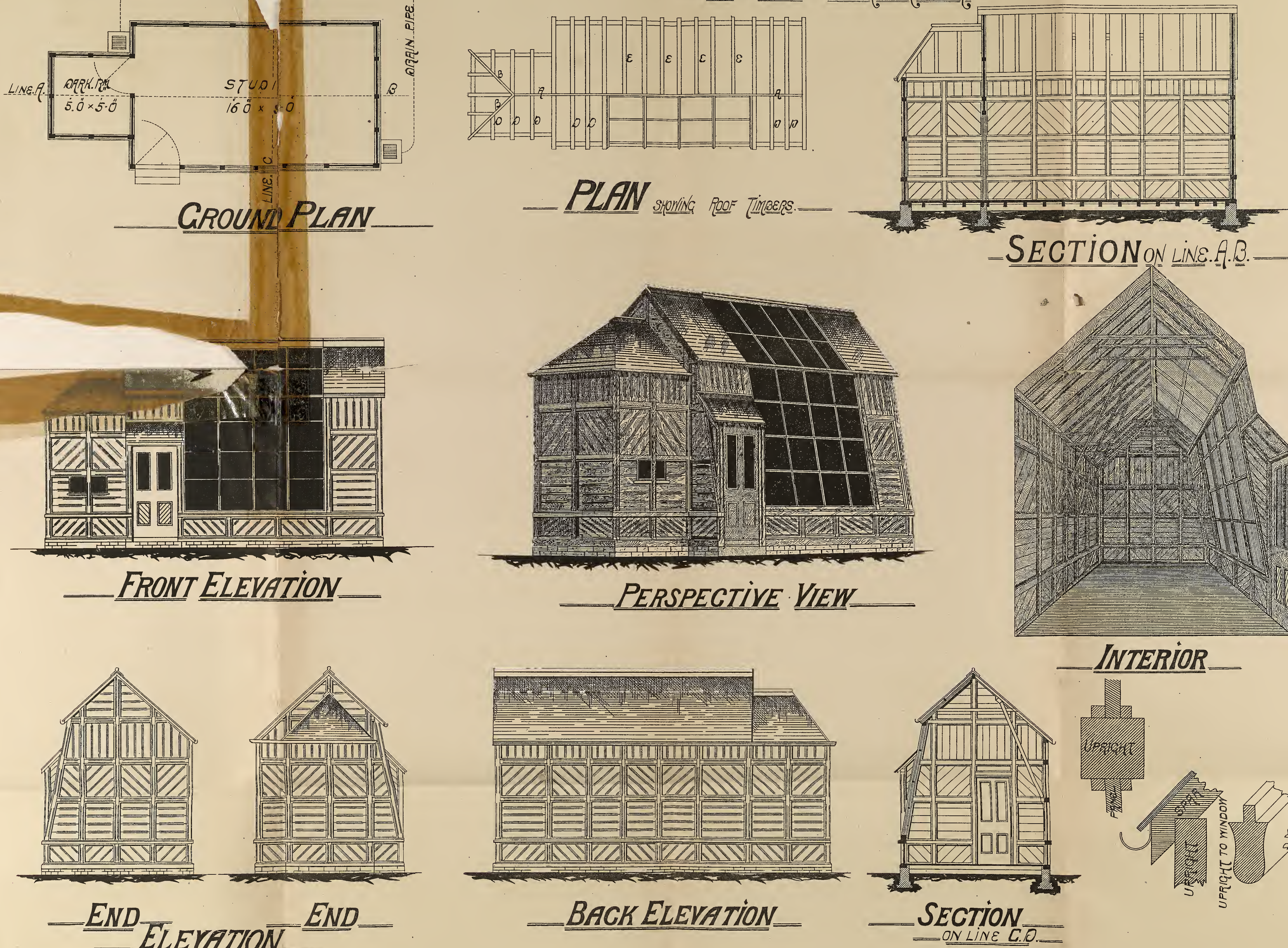
AMATEUR MECHANIC

DESIGN FOR PHOTOGRAPHER'S STUDIO & DARK ROOM

BY JAS PARKINSON



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AMATEUR WORK,

ILLUSTRATED.

EDITED BY THE AUTHOR OF

"EVERY MAN HIS OWN MECHANIC."

WITH TWELVE SUPPLEMENTS,

Containing Designs and Working Drawings to Scale,

For Various Pieces of Work, Useful and Ornamental.

AND

SEVERAL HUNDRED DIAGRAMS AND ENGRAVINGS ON WOOD.

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AMATEUR WORK, ILLUSTRATED.

SUN-DIALS AND DIALLING.

By ARTHUR YORKE.

I.—DIALS, HORIZONTAL AND VERTICAL.—HOW TO SET OUT A DIAL.

To enter deeply into the theory and principles of dialling would be out of place in a practical publication like the present. They rather concern the mathematician than the mechanic. Together with the actual construction of dials, they have, however, formed a favourite relaxation of philosophers in many ages. Thus rules have been deduced for the construction of many complex, and, for practical purposes, almost useless dials—things of value only as matters of curiosity, and as means of displaying the scientific skill of their makers. Among these are the reclining and declining dials, and the still more complex moon-dial.

With these philosophical toys it will be little to our purpose to deal. In treating of the science of dialling, what I propose to do is to give the rules on which the simpler and more useful dials are constructed, and to do so in such a manner that they may be carried out by any person of ordinary ability, without the aid of special instruments.

As regards the theory of dialling, it will be sufficient for me to state that a horizontal dial is assumed to represent, and to be parallel with, the plane of the horizon; and with that plane every vertical dial is assumed to be a plane at right angles; whilst that edge of the gnomon by which the shadow is cast, represents, and should be parallel with, the axis of the earth. Bearing these assumptions in mind, it is easy to understand that a gnomon which will be correct for all places of the same latitude will be incorrect for all others, and that it must vary in its inclination, as it is used nearer to or farther from the equator; and also why, before constructing a dial, it is necessary to ascertain the latitude of the place at which it is to be erected.

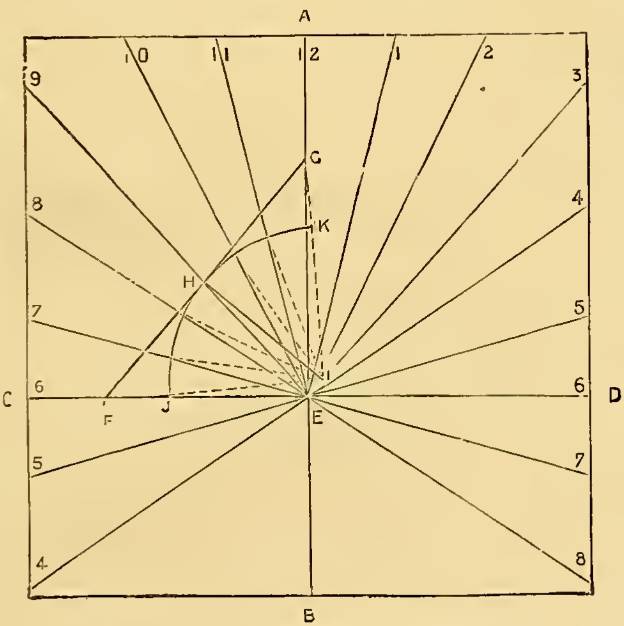


FIG. 1.—HORIZONTAL DIAL FOR THE LATITUDE OF LONDON.

The gnomon, it may be explained, is that projection from the face of the dial by which the shadow is cast. It means, literally and simply, "that which indicates." That edge of the gnomon by which the shadow is cast is called the "stile." The line on the face of the dial from which the gnomon projects is the "sub-stile."

The two most ordinary, simple, and useful forms of dial are the Horizontal and South Vertical. The horizontal dial we commonly see placed on the top of a pedestal. As a teller of time it stands first in utility, since it will mark all those hours in which the sun is fairly above the horizon; that is to say, in the height of summer, from four o'clock till eight. Its disadvantage is, that, except under very unusual circumstances, it can only be read from near distances. Considered as an object of taste and decoration, it is rather the pedestal than the horizontal dial itself which is capable of much embellishment.

Next in importance is the South Vertical Dial. This dial must occupy a wall or other elevation facing due south. Of all dials it is the most simple, complete,

and symmetrical, and is in itself best adapted to be made ornamental. It tells the time from six in the morning till six at night.

East and West Vertical Dials—that is, dials to occupy walls facing due east and west—are not difficult of construction; but the period during which they mark the time cannot in the longest day exceed eight hours, and they want that symmetry which renders the south dial so well adapted for ornamental purposes.

North Vertical Dials are also sufficiently simple, but they tell time only before the south dials begin, and after they cease to act; that is to say, before six a.m. and after six p.m. Practically, therefore, they are next to useless.

Vertical Dials for walls which do not face either of the cardinal points can be made, but their structure is complex and difficult. I do not propose to waste space by giving rules for making them. If the diallist has a wall of this kind on which to work, it is simpler and better to make one side of his dial so project, that a cardinal point may be faced.

To Set Out a Horizontal Dial.—On a sheet of paper of the required size of the dial draw the central line A B (Fig. 1). This is the twelve o'clock line. It represents the meridian of the place for which the dial is made, and is the line in which the sun is, or ought to be, at twelve o'clock. At a little more than one-third from the bottom of this, draw the line C D, cutting it at right angles in E. This may be called the six o'clock line.

We now need to know our latitude. A terrestrial globe, a gazetteer, or the index of an atlas, will, if we cannot find our exact latitude, give us that of some place sufficiently near to serve for all practical purposes. On the line C E, and at any convenient point, as F, we set off a line making, with F E, an angle equal to the latitude of the place at which the dial is to be used. Thus for London we must allow $51\frac{1}{2}°$, for York $54°$ (nearly). This line, continued to the meridian, will cut it at G. The triangle F G E, will give us the form of the gnomon, but it has also to assist us in finding what we need first—namely, the hour-lines.

To do this, from H, the centre of the line F G, we must let fall a perpendicular equal to half its length, as H I, and draw lines to I from F and G. Then with I as a centre, and with I H as radius, we must describe the quadrant J K. This we have to divide into six equal parts, and through the points thus gained we have next to draw lines from I till they meet the line F G. Through these points of contact on F G we may now draw lines from E to the circumference of the paper, and we shall have the hour-lines from six a.m. to twelve at noon. To get the afternoon hours we have merely to fold the paper at A, B, and prick through with a point to the opposite side, for the two sides of this dial are just alike. The hour-lines for four and five in the morning, and seven and eight in the evening, are to be obtained by merely continuing the morning seven and eight and the afternoon four and five hour-lines beyond F. The half and quarter hour divisions are to be obtained by a continuation of the process which gives us the hour-lines.

Fig. 2 shows the gnomon for this dial. Its form is that of a triangle equal to F G E, in Fig. 1. Its angle A is the same as F in Fig. 1, and is made to agree with that of the latitude of the place, which, in the present example, will give an angle of $51\frac{1}{2}°$. When placed perpendicularly on the dial its position will be on the meridian line A, B, the point A falling on E, and the line A C falling along the meridian line in the direction of G. The point B will be that which projects farthest from the dial. The line A B will be the "stile," or that which casts the shadow, and the line A C will be the "sub-stile." The angle formed by these two is called the "elevation" of the stile.

At the beginning of the above rule I spoke of the meridian as the line in which the sun had, or ought to have, his place at twelve o'clock. This implies an amount of irregularity in the sun of which he is not suspected by the majority of people. Even amongst the educated the greater number hold the belief that a true sun-dial will always tell true time. This, literally understood, is simply a vulgar error. When Pope bids presumptuous man "Correct old time and regulate the sun," he by no means commends him to a needless task. The sun is in reality a most indifferent timekeeper, and wants a great deal of correcting. In this particular department of his business he is outdone by clocks of even moderate punctuality. Apart from some minor disturbing influences, the fact that the plane of the ecliptic in which he moves is not parallel to the plane of the equator, necessitates that he should really come to the meridian precisely at twelve o'clock on four days in the year only, namely, the 20th of March, the 21st of June, the 23rd of September, and the 21st of December. At other times he will either be before or behind that time. About the 1st of November he comes more than sixteen minutes too soon. This, however, by no means renders the sun-dial valueless as a teller of time. He is regular in his irregularities. The daily difference between clock and sun can be, and has been, accurately calculated, and is given in most almanacks. So that by adding or subtracting the difference, as the case may require, to the time shown by the sun-dial, absolutely correct mean time may be ascertained, and clocks and watches set right.

To Set Out a South Vertical Dial.—As in the last

problem the meridian A B, Fig. 3, has first to be drawn, and at any convenient point upon it, as C, a perpendicular of indefinite length must be erected.

For setting out this dial and its gnomon we require not the latitude itself, as in the last problem, but the complement to it, that is, so many degrees as will bring it to 90°, the degrees of a right angle. Still, assuming that we are working for London, we must subtract the latitude of that place, 51½° from 90°, which will leave 38½°, and that is the complement we require.

From A we now set off a line at an angle of 38½°, which will cut the perpendicular at D. And from D we set off another line at the same angle of 38½°, or whatever the given complement may be, which will cut the meridian at E.

Through E we draw the line F G at right angles with the meridian. Then taking E H equal to E D, and with H as a centre, we describe the quadrant E I. This has to be divided into six equal parts, and through the points thus gained lines have to be drawn from H, cutting the line F G at K, L, M, F, and G. Lines drawn through these last-named points from A to the circumference of the paper will give the hour-lines from noon to six p.m. ; and of these the morning lines will be the exact counterpart.

Fig. 4 shows the gnomon for this dial, in which the angle B must be equal to the complement of the latitude, that is 38½°. When it is fixed perpendicularly to the dial the angle B will fall upon the point A in Fig. 3, and the line B A will fall down the meridian line towards B ; C being the projecting angle.

Another method of setting out this dial is by proceeding as with the horizontal dial, Fig. 1, but using instead of an angle equal to the latitude, one equal to its complement. The method described above is, however, the one usually followed.

To Set Out an East Vertical Dial.—To do this we must first draw the horizontal line A B, Fig. 5, and at B draw the line B C, making the angle A B C equal to the complement of the latitude. Then at D, and with any convenient radius, we have to describe a circle. Touching this circle at I and J, we have to draw two lines, E F, and G H, parallel to C B. Through the centre D, and at right angles to C B, we draw I J, which is our six o'clock line. To obtain the other hour-lines we divide each of the four quadrants into which the circle has been cut, into six equal parts, and from the centre D, through the points thus ascertained, we draw a series of lines till they cut E F, and G H. By uniting the corresponding points of intersection on these two lines, we get the hour-lines 4, 5, 6, 7, 8, 9, 10, and 11 ; which include as long a portion of the day as this dial will mark.

Fig. 6 is the gnomon of this dial. Unlike the former examples, which are triangular, this is a parallelogram in shape. Its width must be equal to the radius I D, of the circle in Fig. 5, and its length should be somewhat greater than the diameter of that circle. When fixed perpendicularly to the dial, it should be placed lengthwise on the six o'clock line I J, Fig. 5, with its centre A falling on D.

A West Vertical Dial is the exact converse of the above, and its gnomon precisely the same.

To Set Out a North Vertical Dial.—This may be regarded as the complement of the South Vertical Dial. It tells those hours of daylight only in which the latter is useless. We shall construct it most easily by availing ourselves of the diagram of the South Dial, Fig. 3. Let us take a piece of paper, and so place it that its lower edge may lie on and coincide with the six o'clock line through A, Fig. 3. To explain more fully, I show in Fig. 7 the upper part of the South Dial, and meeting with it and joining it at the line through A, the lower edge, Y Z, of the paper W X Y Z, on which the North Dial is to be drawn. First, we produce the meridian B A, upon our paper to C. Then we continue the hour-lines five and four through the point A, to the opposite edge of the paper. These give us respectively the evening hours seven and eight. The morning hours four and five may be obtained in like manner by continuing the morning seven and eight hour-lines from the South Dial. The lower edge of the paper is the six o'clock line, and as our North Dial marks time from four to six a.m., and from six to eight p.m. only, we have now completed it.

The gnomon is precisely the same as that of the South Vertical, but must be placed upside down. Thus the angle B, Fig. 4, must fall on the point A, Fig. 7, and the line B A will lie along the meridian in the direction of C.

As much of what I may call the scientific part of dialling as is likely to be of general use, is included in the above rules ; we may now turn to the more practical part of our subject.

When anyone of my readers proposes to make a dial, it will be well for him to work out the required problem to the same size as the intended dial. This will be far better than working it on a small scale, and afterwards enlarging it. On a large scale errors are far less liable to occur, and it must be remembered that unless worked out with perfect truth and precision throughout, the dial will be worthless as a time-teller. If the worker has not been in the habit of making mechanical or architectural drawings, I may observe that his better plan will be to use a drawing-board, and strained paper. The sides of a drawing-board will be straight lines, and its corners right angles, so that by working with a T-square he will have no difficulty in keeping his lines true.

Paper is strained by damping it on both sides with a clean sponge, and then, after leaving it four or five minutes to soak and swell, gluing or pasting it round the edges to the board. As it dries, it shrinks and stretches itself as tight and smooth as the end of a drum, and thus allows of truer and more satisfactory drawing than when merely pinned down. When the drawing is finished, the paper can be cut from the board.

It can then be laid upon the surface of the actual dial, and its lines traced off. There are various well-known ways of doing this ; such as covering the back with chalk or charcoal, and going over the design with a hard point; pricking holes and rubbing some powdered colouring matter through them ; etc.

Before beginning the tracing one important fact has to be borne in mind. In theory, and consequently as shown in our diagrams, the gnomon is a mere line. In practice, however, it must have so much thickness of material as will enable it to resist any forces which might bend or break it. Due allowance must therefore be made for this thickness. Before we begin to trace, we must decide what the thickness of the gnomon will be ; and then cutting our paper plan in

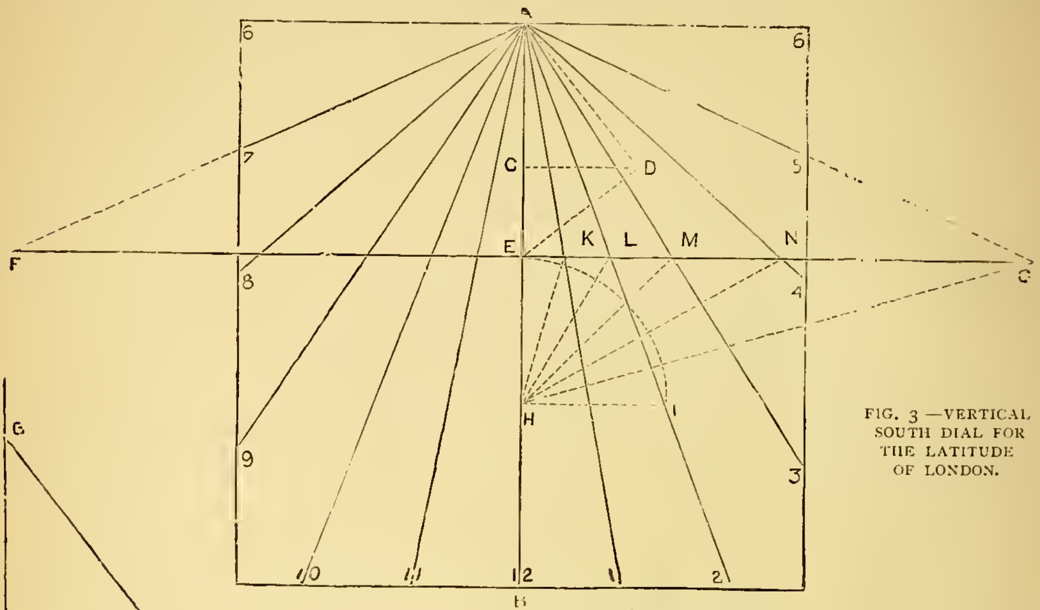


FIG. 3.—VERTICAL SOUTH DIAL FOR THE LATITUDE OF LONDON.

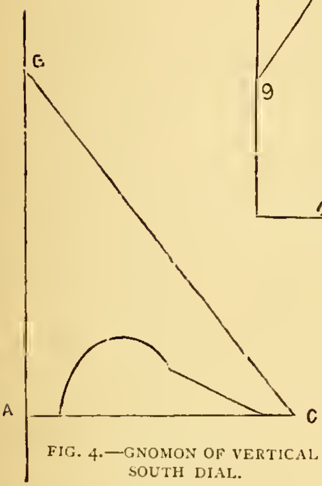


FIG. 4.—GNOMON OF VERTICAL SOUTH DIAL.

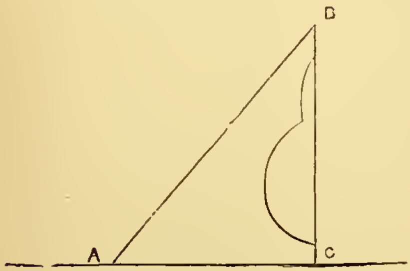


FIG. 2.—GNOMON OF HORIZONTAL DIAL.

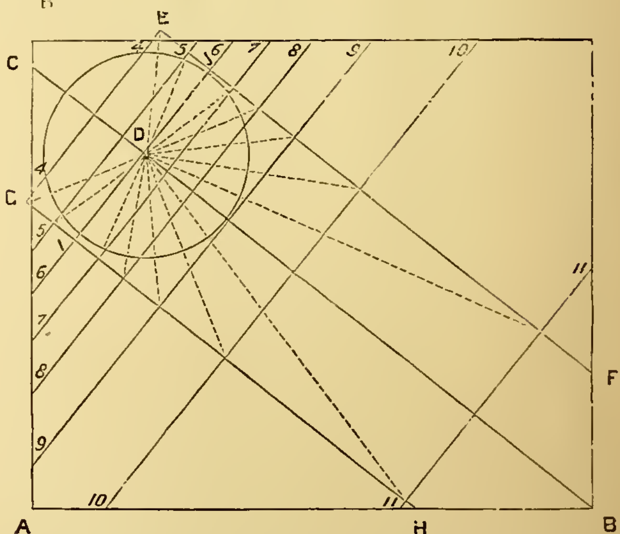


FIG. 5.—VERTICAL EAST DIAL FOR THE LATITUDE OF LONDON.

two, up the line on which the gnomon is supposed to stand, we must fix the pieces on the actual dial just so far apart as to allow space between them for the actual gnomon to be placed.

The materials to be used by the diallist will much depend on the locality in which, and the circumstances under which, he works, and his own taste; yet I may perhaps be able to give some useful suggestions.

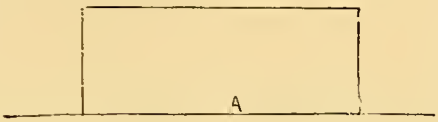


FIG. 6.—GNOMON OF VERTICAL EAST DIAL.

Against a house or other building of asblar, brick, or stucco, if the workmanship is level and good, there can be no difficulty in simply painting a dial. In ordinary oil colours it may stand for years. Witb a trowel, any hollows or inequalities may be filled up with a little cement, the wall having first been damped. The space for the dial may be covered with a couple of coats of some light colour, which will tbrow up the figures and lines well—say a stone colour. If the porousness of the wall is found an objection, by absorbing the oil too rapidly, and thus causing the colour to clog rather tban to work freely, going over it first with linseed oil will remove this difficulty. On the painted background it will be a simple matter to trace and pencil in the lines and figures of the dial.

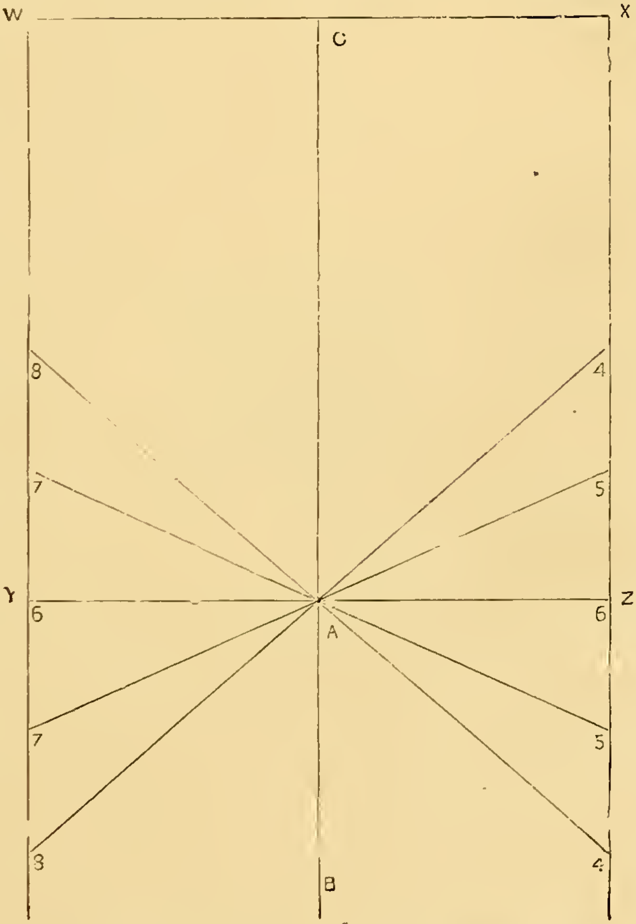


FIG. 7.—VERTICAL NORTH DIAL FOR THE LATITUDE OF LONDON.

The gnomon, if of metal, can have a couple of pins attached to it, and be fixed by letting these into two holes drilled into the wall, and there cementing them. A square should be used in setting the gnomon, that it may be set perfectly perpendicular to the dial. If the height and position of the dial are such as to render the danger of breakage small, the gnomon may well be made from a piece of slate, which is more easily worked by the amateur than metal, and of which the virtual cost is nothing. A slate gnomon will need cementing into a groove. Beyond the trouble of the diallist, it will be seen that the cost of erecting such a dial as this will scarcely be appreciable.

If the wall should happen to be of good freestone masonry, a more workmanlike and enduring thing may be made by incising the lines and letters of the dial. A smooth face on which to do this, may be obtained by rubbing down the required space with water and a flat piece of grit-stone. Any stone which, like Yorkshire paving-stone, is composed of a sharp, hard sand, will do this. When the surface has been gritted and washed clean, the paper plan of the dial can be stuck to it with wafers, and a tracing made. The lines and numerals will then need to be cut pretty deeply into the stone with V-shaped incisions. Freestone cuts easily. If the worker does not possess stone-cutting tools, he will find a carpenter's or wood-carver's chisel do equally well, and be little the worse for it.

As in this case the ground will not be painted, before the letters are painted black, it will, in order to prevent running of the colour, be well to pencil them over with japan size. There are two ways in which black paint is applied to incised letters in stone-work. One is to "write" them in with the pencil. Practice, patience, and a steady hand, are wanted to do this well. The other is to "slush" them in; that is, to dab the colour into the incisions with a big brush.

In doing this it matters nothing how much colour may be daubed upon the face of the stone beyond the incisions, for when the paint has dried, the whole face has to be rubbed down with grit-stone, till all superfluous paint has been ground off. If the cutting has been well done, the letters will with this process come out as well as if put in by the most skilful " writer."

(*To be continued.*)

A COMBINED POULTRY AND PIGEON-HOUSE.

By AN AMATEUR WOOD-WORKER.

THE purpose of the following article is to describe the construction in detail of a combined poultry-house and pigeon-loft, erected in my own garden, according to the designs given. I claim for the house that it possesses certain novel adaptations of old principles; and, inasmuch as the accommodation I had was limited, can from practical experience say that those who wish to make a five-pound note go a long way, might do worse than read the account I offer. At the outset, I assert that fowls will not pay if badly housed, and that warm, well-ventilated, and easily-cleaned quarters are the best for poultry as well as for men.

The ground at my disposal measured 22 feet wide by 8 feet deep, with walls on three sides; in fact, a strip taken off the end of a back garden. This space I decided to divide into three portions, to consist of a centre covered-in house, and an enclosed run on each side. Fig. 1 will show the dimensions of the house, viz., 6 feet square; and those of the runs, viz., 8 feet square. It will be observed that the ground plan of the house shows that it is divided into two unequal parts, viz., one 4 feet deep by 6 feet wide; and the other at the rear 2 feet deep by 6 feet wide. The portion marked A is intended for the breeding house, and the part marked B for a covered-in shady run under the roosting house, for the fowls in wet or hot weather. As a general rule, the yard lettered C is devoted to chickens and pullets, with roosting accommodation in the breeding place, which is fitted with a movable partition; and the run D is allotted to fowls, which roost in so much of the house as surmounts the dry shed.

One of the great desiderata of the fowl-keeper being perfectly dry quarters, the first care should be to level the ground, giving it an incline from back to front, so that all rain and surface-water may get speedily away, and the earth of the runs may not be pattered into slush, than which nothing is more hurtful to the fowls and more objectionable to the henwife. At this stage you should tread down the mould to form a solid floor for the fowl-house. As a further protection against damp, and a means to make the house substantial by preserving the supports from rot (at the same time rendering it portable, and not a landlord's fixture), it would be well to place a single layer of bricks as a foundation upon which to rest the bottom frame of the structure. The skeleton of the building may then be prepared in the workshop, taking care to number each piece, so that the whole may be fitted together when complete, without confusion. Fig. 2 will show the parts to be made, and the measurements of each length of quartering.

Four 8 feet lengths of quartering 3 inches by 3 inches are necessary for the 6 feet square ground frame; the uprights, joists, and rafters are all of $2\frac{1}{2}$ inch by $2\frac{1}{2}$ inch wood; the lengths, which cost $1\frac{1}{2}$d. per foot for the 3 inch and 1d. per foot for the $2\frac{1}{2}$ inch quartering, require no planing;—in all, 150 feet of the smaller size quartering will be wanted. The joints used are of the ordinary description, as shown by the sketch in Fig. 3, which represents a corner of the bottom frame, and the sketch in Fig. 4, which depicts the joints of the upper frame. Fig. 5 gives the mode of fastening the cross-pieces, which in the larger of the two divisions, are placed 2 feet from the ground as joists for the loose floor of the compartment of the house, reserved to fowls and egg boxes; the floor-forming at the same time a roof to the dry shed beneath. In the smaller division, these joists are 4 feet from the ground, and the lower part is set aside for nesting places; the upper serving as a pigeon-loft which extends to the roof. The object in placing the nests, for sitting, upon the ground, is to give the eggs, whilst incubation is in progress, the benefit of the moisture of the earth. Hence the dry run underneath the larger compartment goes no further than the wooden partition which intervenes. The upright which bisects the front of the house is intended for a stop for two large doors, which are to hang upon the outer supports. Eight rafters, each of 3 feet 6 inches length, will be wanted for the roof, and they are simply nailed in position, the plank placed at the apex acting as a sort of key-board, and the weight of the roofing material to be hereafter added being sufficient to make all secure.

Having proceeded so far, the framework of the house may be erected on its site, and when fitted together, pending further additions, it would be well to temporarily nail an odd strip or two of wood diagonally here and there, to make the whole the better able to resist wind and weather. Also the projecting corners, as drawn in the sketch, may be sawn off in continuation of the lines of the roof.

The roofing of the building must next engage attention. After fully deliberating upon the respective merits of felt, corrugated iron, and sheet zinc, I have decided that the latter is the most suitable material to the purpose. Felt harbours vermin, requires early renewal, and necessitates a wooden roofing underneath it. Corrugated iron, which is at present much recommended by manufacturers of poultry appliances, is expensive and is very hot in the sun, and very cold in time of frost. Moreover, it wears badly, and soon begins to leak where nails are driven through. Zinc is one-third less expensive, looks as neat, and is twice as durable, and can be fixed without trouble. For the roof 63 square feet of No. 10 zinc will be needed. The weight should be 17 pounds to the sheet, measuring 6 feet 8 inches wide. Three such sheets will be sufficient; and if one of them be cut in two, they may be overlapped an inch or so, and with a few nails all soldering will be avoided. Out of the same quantity, three pieces 12 inches wide, and 3 feet long may be cut. With these a semicircular ridge, to bend over the key-board of the roof, can be formed, and if care has been taken not to carry the sheets of zinc quite up to the top, a species of ventilator will be the result, the air having free access to the channel, running the whole length of the building, whilst direct draught is obviated, and no rain-water can enter. The roof will have eaves extending 4 inches from the sides of the house.

The zinc that is required may be purchased for 14s. In addition to the ventilation provided by the channel on the crown of the roof, it will be found that the zinc plates, resting on the rafters, will not fit closely to the two sides of the house, but an aperture will be left underneath the eaves. This aperture should not be wholly closed in, the advantage being obvious. A well ventilated but not a draughty roosting house is a necessity. A wooden strip $2\frac{1}{2}$ inches wide should, however, be nailed horizontally under the eaves.

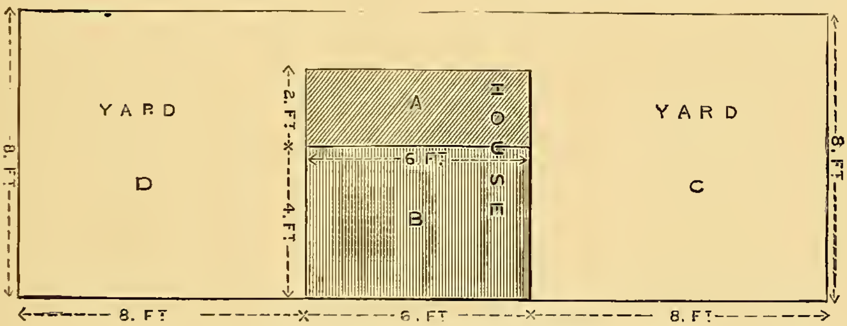


FIG. 1.—PLAN OF POULTRY-HOUSE AND RUN, SHOWING DIMENSIONS.

The time has now come when the boarding in of the four sides must be considered. As cheapest, warmest, and most weather-tight, I recommend 6 inch match-lining (it is practically $5\frac{1}{2}$ inches in width) for the purpose. No planing will be wanted except that which it has received at the mills. The tongue-and-groove method of joining each strip to its fellow, ensures the air-tightness of the interioi, and prevents the possibility of the boards themselves from warping; and, in addition, the superadded beading lends an ornamental appearance to the exterior, which is very desirable. This match-lining is bought by the "square" of 16 feet, and three such squares, at 11s. 6d. each, will give ample material.

Before directing attention to the manner in which the four sides of the poultry-house are to be constructed, I must premise that its principal distinguishing feature is the facility with which one can get at every part of the interior without requiring to go inside. Wherever a place is inconvenient to reach, the chances are cleansing will be neglected and dirt accumulate, a state of things fatal to success. Therefore, in the whole arrangement of the divers compartments, I lay down the rule that every corner shall be easily accessible, and that the kid-gloved henwife may not be compelled to enter the house. If this be understood at the outset, it will readily be seen why the structure consists almost entirely of doors. From the fact that the match-lining throughout is used horizontally, the number of doors, however, is not obtrusive, as many of them, indeed, are hardly noticeable.

Figs. 6 to 9, representing the four sides of the house, will give an idea of the positions of the various modes of obtaining access to the interior. The rear (Fig. 6) is boarded up from top to bottom with the exception of two widths of match-lining 4 feet from the ground, which are battened together to form a flap, and are hinged as shown in the sketch. This flap (No. 1) is to allow the loose flooring of the pigeon-loft, situated in the uppermost part of the building, to be withdrawn whenever necessary, that

the boards may be cleansed without trouble, and effectually. The left side (Fig. 7) of the poultry-house faces north. The small door, No. 2, is hinged to the outer upright, and does not extend quite to the top. By it the pigeon lockers are gained. Underneath it is door No. 3, hinged to the same upright, and allowing good height (4 feet) to permit of entrance to the breeding house for fowls, the nests in which, it will be remembered, are placed on the ground. No. 4 is simply a larger flap than

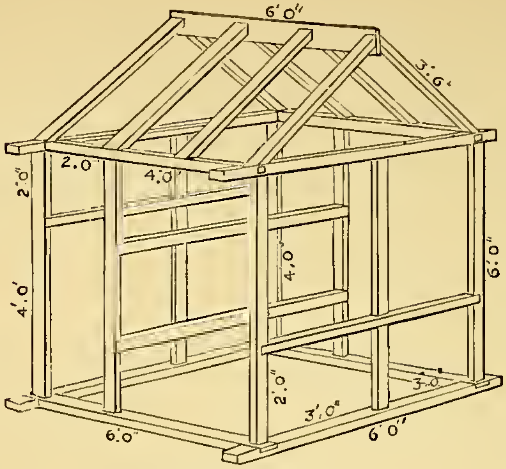


FIG. 2.—SKELETON OF BUILDING, SHOWING LENGTH OF PARTS.

No. 1, consisting of match-lining battened together to the width of 2 feet, and hinged from the plank above it. When down, this flap shuts in the dry shed running under the roosting compartment; when open at an angle it enlarges that shed, admitting at the same time fresh air. Passing to the front of the house (Fig. 8) doors, Nos. 5 and 6, each 4 feet high by 3 feet wide, open up the entire roosting compartment. It is important that this pair should be made to fit well. Below is No. 7—a flap similar to No. 4, but 2 feet longer. It is intended to allow of the earth of the dry run being removed from the front without the inconvenience of entering the closed yards. It is desirable that the material forming the floor should be changed as often as it becomes polluted. On the right side (Fig. 9) of the house facing south there are two flaps, viz., a small one, 10 inches deep (No. 8), which opens on to the egg boxes, and No. 9, a larger one, identical in every respect with No. 4, on the opposite side. When it is wished that the dry run should be at the disposal of yard D exclusively, it will be necessary to keep door No. 6 closed, but when there are no chickens and pullets to occupy yard C, and the whole of the available space is to be given to the adult birds, by lifting No. 9 flap and No. 4 at the same time, the dry shed accommodation will be much increased, and the feathered inmates may roam without check wherever they will. The last entrance, No. 10, is 4 feet high, and leads into the breeding-house. The open space above it is the dormer part of the pigeon-house.

There are four windows to be added, one on either side, the glass of which slips backwards and forwards in a rabbet, and two in the front which are for lighting purposes only, the glass remaining fixed, with strips of wood at the back and a beading in front.

Preliminary to fitting the doors, lengths of 2 inch pine beading must be nailed to the uprights as a stop. The cost of such pieces is two shillings. All the doors are made in the same way, consisting of match-lining nailed to two battens formed of the same material, sawn in half. One inch and a half flat headed wrought-iron nails should be used, as they drive cleanly into the wood. Some time will be spent in this part of the work, and open-air labour will be saved by nailing together the doors full-large in the workshop, and afterwards fitting each by sawing it to its exact dimensions and planing down the edges when ready. Cross-garnet, or T, hinges are the best suited to bearing the weight of the doors. For the two largest (Nos. 5 and 6,) the 16 inch size will be required, for the strain is great from the side. All the other flaps and doors have the 10 inch size. It is perhaps needless to observe that the hinges should be so placed that the $\frac{3}{4}$ screws may be in the centre of the plank. The doors which form

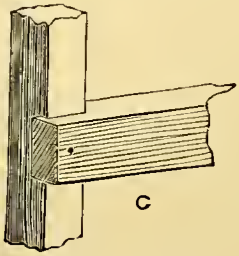


FIG. 5.—DIAGRAM SHOWING MODE OF FASTENING CROSS-PIECES.

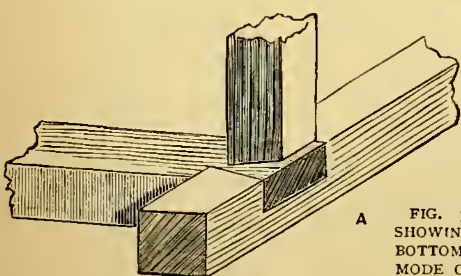


FIG. 3. — DIAGRAM SHOWING CORNER OF BOTTOM FRAME, AND MODE OF JOINING THE PARTS.

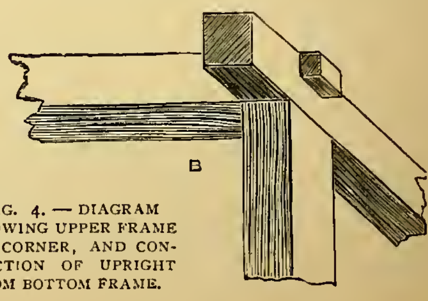


FIG. 4. — DIAGRAM SHOWING UPPER FRAME AT CORNER, AND CONNECTION OF UPRIGHT FROM BOTTOM FRAME.

integral parts of the divisions of the house necessary to be weather-tight and warm, should be nicely constructed, and some trouble taken in fitting will be amply repaid. The flaps to the dry shed are not so essential, and less care may be expended upon them. Should the doors warp in the fixing, no great anxiety need be felt, for when they have been hung a short while they will be sure to regain their right shape. They should all be secured with wooden buttons.

The window and other apertures should be cut when the match-lining is fixed, a key-saw being first used. They will not lessen the strength of the walls if cut in the centre of the planks.

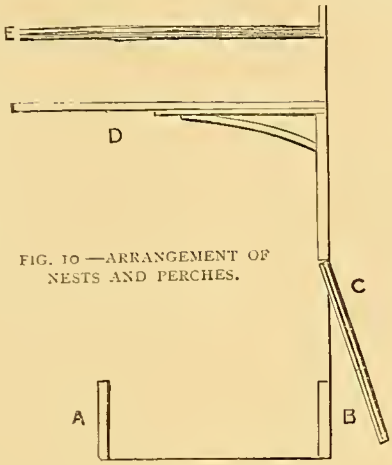


FIG. 10.—ARRANGEMENT OF NESTS AND PERCHES.

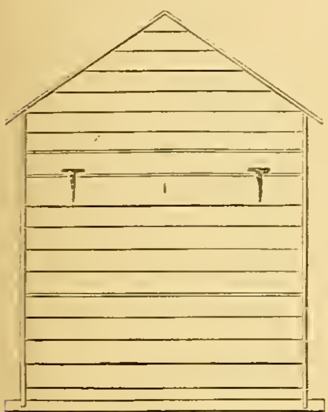


FIG. 6.—REAR OF HOUSE.

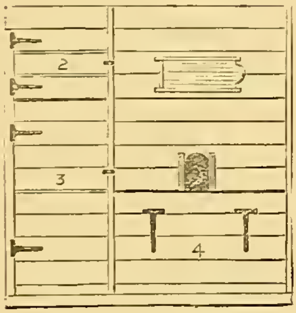


FIG. 7.—LEFT SIDE OF HOUSE.

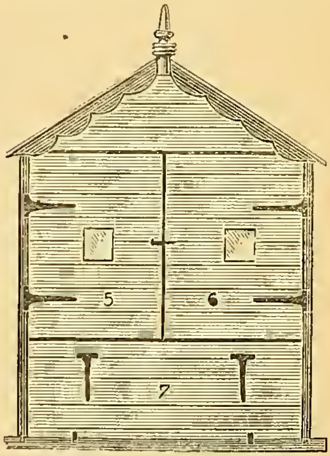


FIG. 8.—FRONT OF HOUSE.

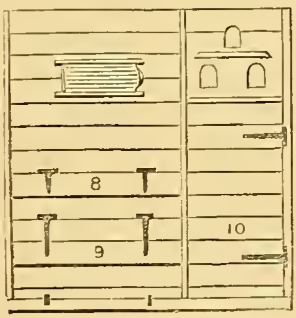


FIG. 9.—RIGHT SIDE OF HOUSE.

Before proceeding another stage, the exterior of the fowl-house should now receive its first coat of paint. Three coats are the rule, and if the last is to be green, the second should be lead colour. Priming of the ordinary description may be used for the first. The oil soaks into the interstices of the wood, the surface of which receives a thin layer of lead. The thinner the priming is put on the better, and the quicker the more economical. If the prepared priming, sold in tins at 6d. per pound, be used, it is the more necessary to paint swiftly, as it dries in almost immediately. About twelve pounds of paint will be needed for the first coat. The main thing to be observed is that the beading shall be properly covered, and therefore the better plan is to paint this first carefully, and afterwards go over the planks, filling in all white places wherever they may be noticed. If beading and planking were treated simultaneously, it would be difficult to discover whether the former had been properly done.

Tinned priming, that is priming sold in tin cans, is not so economical as that bought and mixed at the oil shop. Of the latter eight pounds will do, where twelve of the former are wanted.

For the second coat about the same proportion of lead colour should be laid thinly on, and these two coats should suffice to preserve the wood effectually. The third coat may be according to fancy, but if it consist of green or of any colour not containing lead, while it will go much further and weigh lighter than the priming, it will serve an ornamental purpose simply, and therefore, if economy be an object, it may from a utilitarian point be dispensed with. But, as will have been noticed, one of the recommendations of the house now in progress of erection is that, by reason of its neatness with regard to material as well as to manner of construction, it is well suited to a small garden whose extreme limits are within full view of the drawing-room and other windows. In short, the combined pigeon and poultry-house should be of no disgrace to its surroundings, and therefore the choice of the third coat of paint merits some consideration.

On reference to Fig. 4, showing the left side of the house, it will be seen that there is a small opening, 9

inches high by 6 inches wide, with a circular top. This is the entrance for the fowls, and it is closed with a sliding panel. When desirous of keeping this panel raised, a loop of wire attached to a screw in it may be slipped over a second screw placed a few inches above it on the side of the house.

So as to prevent the sliding glasses of the windows from being withdrawn too far, a screw should be hardly driven in some few inches beyond the aperture on the side to which each pane is slipped.

To complete the front of the house two planks, cut to an ornamental pattern, should be nailed under the eaves, but not close up to the match-lining, the intention being to allow a current of air to ascend under them, finding its way to the channel on the ridge of the roof. These boards may be mortised into a spike which gives a finish to the whole, and nailed at their further extremities to the projecting strip of wood running under the zinc plates at each side of the house.

On the right side of the building it will be noticed that three pigeon-holes are provided. These should be cut in a permanent partition, their measurement being 6 inches by 4 inches. The partition should be nailed to the inner side of the uprights and two shelves, one under each opening, added to serve as an alighting board, which ought not to measure less than 6 inches in width.

The exterior is now completed, and the interior remains to be dealt with. As a preliminary, any spare mortar, sand, and lime may be thrown into the dry run, where it will tread down and form an excellent floor. Although perhaps it would be wisest to leave the following addition to the last; still, here it should be said, that as a means of protection against the burrowing of rats, whilst retaining the advantages of the moisture of the natural soil, a length of 18 inch galvanized wire-work, 1 inch mesh, should be placed on the floor of the breeding compartment. A little mortar will be sufficient to keep it in position.

In the whole of the interior there is but one permanent partition—that is, there is a single part only which is nailed, all the other portions are removable at pleasure. The exception is the boarding which divides the breeding compartment and pigeon-loft above it, from the dry shed and roosting-house. If the first pair of rafters from the back have been placed to correspond with the uprights 2 feet from the rear, as shown in Fig. 2, the match-lining, nailed vertically, may be secured to them at the top, and to the uppermost joist at the bottom, taking care to nail the planks on the side to allow of the top of the joist to remain free to support the flooring of the pigeon-loft. No difficulty will be met with if the match-lining be sawn into two lengths, the shorter to reach from the roof to the first pair of joists in the smaller part of the house on the one side, and the longer planks to be nailed to the same pair of joists on the opposite side, and to extend to the ground, in which a piece of quartering 3 inches by 3 inches should be sunk as a stop.

If the measurements are a little out, a fillet of wood nailed to the joists will make everything easy. As regards the flooring, all that requires to be done is that broad planks be sawn to the exact length, and fitted to extend from back to front. The boarding need not be of more than $\frac{3}{4}$ inch stuff, but the broader the planks the better, for they will be easier to remove when it is desired to cleanse them, or for any other purpose, and the quicker to replace when that purpose is accomplished. If the flooring be of a slight nature, however, a plank strong enough to bear a man's weight should be made fast in the centre of the fowl-house, for it will be found convenient to stand upon it, and so obtain command over every corner of the roof.

The flooring in the pigeon-loft is best made of planed wood, as it is the most easy to clean. The advantage of having it loose is obvious, for by lifting one or two of the planks the whole of the loft may be easily reached by a person entering the breeding place underneath and popping his head up.

To return to the roosting-house, there remain to be fitted the nests and the perches. The former consist of a strip of wood, 4 feet in length and 4 inches high, which forms the front to a set of four egg-boxes, each 12 inches wide, and without bottom, which are simply made by nailing at every foot an upright piece of board 11 inches wide and 18 inches high. Stability may be given to them by a thin length of wood, nailed along the top. As a back to this row of nests, a piece of wood 4 inches high should be dropped into grooves attached to the uprights of the building on the right and left of flap No. 8, against which the skeleton boxes should be set so that a person by lifting the flap may take the eggs out of the boxes without entering the house. The reason why the back of the nests should be movable, is that they may be cleaned without inconvenience. The arrangement of the nests and perches is shown by Fig. 10.

A is the skirting nailed to the front of the boxes, B the movable back running in grooves at each end, and C the hinged flap on the outside of the building. D has not yet been mentioned. It is a wide shelf resting upon, but not attached to, brackets, and serves a double purpose: first as a roof to the egg-boxes beneath, giving them that privacy in which laying hens delight; and, second, as a tray to catch the droppings of the fowls roosting upon the perch E, which is slipped into sockets 4 inches above it. This plan is highly desirable, conducing at it does to the rapid and effectual

cleansing of the house daily. The perch, by-the-bye, should be four inches in circumference, a branch with the bark on being the best. The shelf will also serve to protect the fowls from an upward draught, which may arise from deficiencies in fitting the floor-boards.

The fittings of the pigeon-loft are simple, consisting of a shelf placed 12 inches above the flooring. On this is placed an oblong box, without top or bottom, and divided in the centre so as to form a pair of nests, which are reached by an alighting board. A similar contrivance is on the floor below it, and other lockers may be put elsewhere if required. But the great thing to be remembered is that overcrowding will render the wisest provision of no utility, and it is better to understock than overstock. A house of the dimensions stated should accommodate with comfort half a dozen fancy pigeons and eight or nine adult fowls, besides chickens. In regard to the latter, when a hen becomes broody her proper place is in the compartment reached by door No. 3, where a nest may be made up for her with three bricks and some moist earth. So soon as the chicks are hatched they may be allowed the run of the compartment, and as they grow older may be given the use of yard C, from which the grown fowls are excluded by closing flap No. 9. Should great pressure be felt in respect to accommodation for young chickens, an excellent run sheltered from the weather is furnished by the dry shed under the roosting-house, the adult fowls being temporarily deprived of it by dropping flaps Nos. 4 and 9. Sunshine and air, combined with perfect safety from cats and vermin, may be afforded by wiring in with 1 inch mesh netting the front side of the run, and if a piece of small quartering be secured to the bottom of the wirework, whilst the top depends from staples driven into the joist above it, the protecting barrier may be readily raised when food and water are to be given to the youngsters.

Fowls entering the house from the yards do so by the side doorway already described, which they reach by means of a ladder made of a plank, with half-a-dozen steps of beading four or five inches apart. If a staple be driven through the plank and the flap No. 4, a peg will suffice to keep both in positions; by withdrawing the peg the flap falls and the dry shed is closed in, whilst the ladder remains in its proper place.

The interior of the house with all the fittings should be brushed with a wash, the basis of which is carbolic powder (price 3d. per pound), and which will impart a pink tone, creating a pretty as well as wholesome effect.

In regard to the yards, detailed description is unnecessary as circumstances alter cases, and the space at disposal may vary. Suffice it to say, that the uprights are of 2½ inches by 1½ inches quartering mortised into a bed of 3 inches by 3 inches stuff. The rafters are of 2 inches by 1½ inches. The wire below is 1 inch mesh nailed to a plank 1 foot high. For the remaining portion of the runs 1½ inch mesh netting is used, and not a corner is left uncovered for the entrance of cats. A door is at each extremity. In conclusion, I give a statement of the actual cost of materials required for the combined pigeon and poultry house, exclusive of the yards—

	£	s.	d.
Quartering	0	18	0
Odd planking	0	2	6
Bricks and Lime	0	3	6
Wood (beading)	0	2	0
Hinges	0	6	2
Zinc for Roofing	0	14	0
Match-lining	1	14	6
Glass	0	1	9
Paint	0	14	0
Nails and Screws	0	3	7
	£5	0	0

VIOLIN-MAKING: AS IT WAS, AND IS.

By ED. HERON-ALLEN.

XI.—THE VIOLIN: ITS VAGARIES AND ITS VARIEGATORS (*continued*).

IN the last number of AMATEUR WORK, ILLUSTRATED, space compelled me to reserve for the present Part the consideration of what may be called the most scientific and useful innovation which has ever assailed the established form of the violin. This is *Savart's Trapezoid Violin, or Box Fiddle*, which was one of the most celebrated and satisfactory experiments ever tried on the construction of the instrument. He was led to its production by a series of carefully conducted experiments, which went to prove—(1.) That a plane surface vibrates much more readily than an arched or curved one. (2.) That consequently there are points on the surface of a violin of the ordinary form where the vibrations are reduced to a minimum, or cease altogether. (3.) That the bouts, corner blocks, and *ff* holes are the principal causes and localities of this reduced vibration. He therefore constructed a violin, the general aspect of which is shown in Figs. 68, 69, the tables of which were practically plane, as shown in Figs. 70, 71, 72, 73, *i.e.*, they were plane on the inner surfaces, but very slightly raised on the outer, to support the increased pressure of the strings, caused by the

extra height, which it was found necessary to give to the bridge to allow the play of the bow. The cause of this trapezoid shape was not founded particularly on any scientific reason, but that it being necessary to have a certain contained mass of air, this shape was best adapted to give the instrument a narrowness at the bridge which would allow the play of the bow and yet have the same interior capacity as if the sides were parallel but broader. Arguing that the sound-holes of an ordinary violin are cut *f*-shaped only, so as to counteract the resistance the curved surface offers to the vibrations, this necessity being absent in the Savart fiddle, he cut his sound-holes straight, as shown in Figs. 68 and 71, on the same principle as those of the Chanot fiddle, viz., that it is expedient to cut as few fibres of the wood as possible; and their exact position in the belly and distance from each other he determined as shown in Fig. 71, by a series of practical experiences. The bar he placed down the central joint of the fiddle by an erroneous course of reasoning, thinking by this means to equalise its influence over the entire surface, which was, of course, a mistake. He also constructed, in some cases, a bar, as shown in Fig. 73, only touching the belly at a point below the bridge, which he found had the same effect as the other form (shown in Figs. 71 and 72), only more durable but more difficult to construct and fix to suit the instrument. He gave to his sides (which were made of the same wood as the back) a thickness of $\frac{1}{12}$th in., and, considering that the absence of the curves would support this substance and gain with this thickness, he used no side-linings. His sound-post, it will be observed, was set behind the bridge, as in an ordinary violin, but more to the right of the instrument. The tail-piece was suppressed on the same principle as in the Chanot fiddle of 1819 (Fig. 67), but as he justly remarks the full tug of the four strings on a tender part of the belly being very detrimental to the instrument, he carried them over a nut set at the bottom of the instrument (B in Figs. 68, 71, 72) to the tail-pin, which was set rather below the centre of the lower side, as shown at C, in Fig. 72).

Fig. 74.

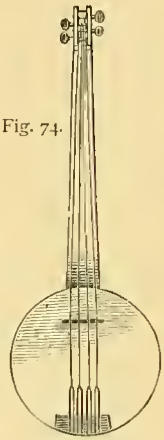
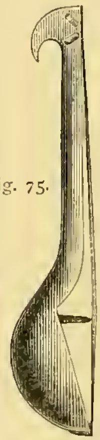


Fig. 75.



THE LOFFEL-GEIGE OR SPOON FIDDLE.
Fig. 74.—Front View. Fig. 75.—Side View.

The merits of the new fiddle were duly considered by a council of the Academie des Sciences, composed of MM. Biot, Charles, Hany, and Prony, to whom were added MM. Birton, Catel, Le Seur, and Cherubini, members of the Academie des Arts. The new fiddle was tested with another, a Cremona masterpiece by M. Lefebure, the eminent violinist, in exactly the same way as the Chanot violin had been compared, and with the same result, viz., that the new instrument was pronounced equal, if not superior to the work of the Italian master. It is interesting to note how these councils of enthusiastic Frenchmen were ready, apparently on all occasions, to rush into the arms of any innovator and reward him in terms of the most fulsome eulogy, but that the musical public on each occasion refused to indorse their opinion, and adopt the innovations. At the same time the construction of Savart's "Box Fiddle," as it has contemptuously been called, was based on sound sense and scientific principle; and there is no doubt that a violin properly constructed on the Savart model, though falling far short of a first rate fiddle of the ordinary kind, would be very much superior to the common Mirecourt wholesale production, besides being very much easier for an amateur to construct. This will be acknowledged readily enough by any one who will take the trouble to compare the diagrams that are supplied of Savart's Trapezoid Violin with those of the ordinary form of the violin which have been given in previous chapters. It is well known that in carpentry it is far more easy to execute rectangular work than it is to manage rounded or curved work, and this pertains in an equal degree in fiddle making, as far as amateurs are concerned. The appearance of the trapezoid fiddle, our readers will observe, is by no means so attractive as that of the violin proper.

For the benefit of any persons sufficiently interested to construct one of these trapezoid violins, I give the exact measurement* of its various parts, which are as follows† :—

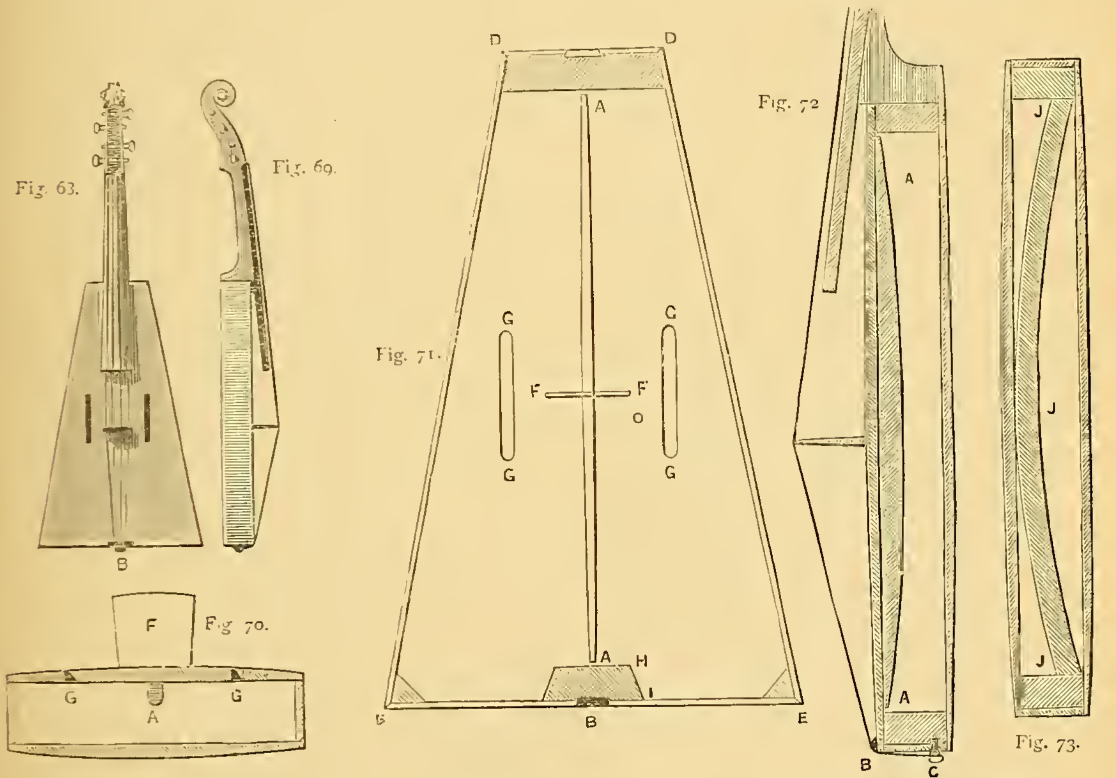
	French inches and lignes.		English inches.
Length of the body (Figs. 71 and 73) ...	13· 0	=	$13\frac{13}{20}$
Breadth of upper end (D D in Fig. 71)...	3· $1\frac{1}{2}$	=	$3\frac{5}{16}$
Breadth of lower end (E E in Fig. 71)...	8· 4	=	$8\frac{3}{4}$
Height of bridge (F in Fig. 70)	1· 6	=	$1\frac{5}{8}$
Breadth of bridge (F F in Fig. 71)	1· 6	=	$1\frac{5}{8}$
Length of sound holes (G G in Fig. 71)...	2· 7	=	$2\frac{3}{4}$
Breadth of sound holes (G G in Fig. 70)...	0· 3	=	$\frac{1}{4}$
Diameter of back and belly at edges......	0· 1	=	$\frac{1}{12}$

* The measurements in French inches are the more exact, the sizes in English represent their nearest English equivalents without considering high fractional divisions.

† For full description of this instrument and report thereon, see F. Savart's "Memoire sur la Construction des Instruments à cordes et à archet" (Paris) 1819.

	French ins.		English ins
Diameter of back in centre	0· $2\frac{1}{4}$	=	$\frac{1}{8}$
Diameter of belly in centre	0· $2\frac{3}{4}$	=	$\frac{1}{4}$
Height of blocks and sides..................	0·$15\frac{1}{4}$	=	$1\frac{7}{20}$
Diameter of sides.............................	0· 1	=	$\frac{1}{12}$
Diameter of blocks	0· 8	=	$\frac{17}{24}$
Length of bass bar (A A in Fig. 71)	11· 2	=	$11\frac{7}{10}$
Breadth of bass bar at ends	0· 2	=	$\frac{3}{16}$
Breadth of bass bar in centre (A in Fig. 70)	0· 3	=	$\frac{11}{40}$
Breadth of lower block, narrow side (H in Fig. 71)	1· 6	=	$1\frac{5}{8}$

violin line. It is called the *Loffel-geige* (spoon fiddle), and is more a joke among musicians than anything else. It is formed of one solid piece of wood like a soup-ladle, and is represented in front view in Fig. 74, and in side view in Fig. 75. The bowl is scooped out, and decked, as it were, with a thin deal sound-board, pierced with two small oval sound-holes. The head is of a curious hook shape, and can boast of the same advantages that were claimed for the reversed scroll of M. Chanot which was noticed in the



SAVART'S TRAPEZOID VIOLIN.

FIG. 63.—FRONT VIEW OR PLAN. FIG. 69.—SIDE VIEW OR ELEVATION. FIG. 70.—SECTION ACROSS SOUND-HOLES. FIG. 71.—PLAN SHOWING CONSTRUCTION OF INTERIOR. FIG. 72.—LONGITUDINAL SECTION. FIG. 73.—DITTO WITH BENT BAR.

References to Letters:—A A, Bass Bar; B, Support for Strings; C, Button holding Strings; D D, Lower End; E E, Upper End; F F, Bridge; G G, Sound Holes; H I, Lower Block; J J J, Bent Bar.

Breadth of lower block, broad side (I in Fig. 71)	2· 0	=	$2\frac{1}{8}$
From nut to top of bridge	12· 2	=	$12\frac{31}{40}$
Depth of bass bar at ends (A A in Fig. 71)	0· 1	=	$\frac{1}{12}$
Depth of bass bar in centre (A in Fig. 70)	0 6	=	$\frac{17}{32}$
Depth of bent bar throughout (JJJ in Fig 73)	0· 6	=	$\frac{17}{32}$

These, therefore, are the principal alterations which have been attempted, a careful study of which only determines the would-be fiddle maker, *stare super vias antiquas.*

Since writing the above remarks, I have received from Hanover a most interesting curiosity in the last paper. An ordinary violin bridge is mounted on the belly, to raise the strings just clear of the long neck. It has no tail-piece, but the strings are attached to loops of D string, which come from pegs set underneath the fiddle, over a sort of rest made of tin, which protects the lower edge of the bowl. Its tone is curious, as might be expected.

Another interesting vagary is the Folding or Traveller's Violin. The neck of this instrument, the body of which is long and narrow, comes off with the finger-board, as do also the bridge, tail-piece, and tail-pin, al of which, with a folding bow, fit into a small rectan-

gular case. As a curiosity, it is good, and as a question of tone and convenience, it is not bad. At the same time, it will go into a portmanteau, and is amusing and handy on occasions when one does not want the fuss of carrying a full-grown fiddle

Amongst violins made of eccentric materials, I omitted to mention a papier maché violin. M. Georges Chanot possesses one of these among the curiosities which characterise his shop. It is painted green and gold, and is as hideous and ghastly as anything can be which bears any resemblance to a fiddle.

Patent Repairs have been the ruin of many splendid fiddles in former years, though now-a-days people are more careful of trusting valuable instruments to the first quack who has some patent operation which will increase the value of any fiddle, according to his own account, tenfold. One, Maupertius, in an article, "Sur la Forme des Instruments de Musique," in the "Memoirs de l'Academie Royale des Sciences," 1724, p. 215, declared that the tone of a fiddle is to be improved by breaking it to pieces and having it pieced together again by a good workman. He argues thus, that the violin ought to be made up of fibres of different lengths, so as to have some of a size to suit every note on the compass of a fiddle. An idea complimentary to the musical powers of glue, but deadly in practice.

Other fiddle-dealers and owners are always tinkering up their instruments by gluing in slabs of wood here, gouging out layers there, shortening or lengthening the bass bar, and shifting the bridge and sound-post about, till the violin, as it were, in very indignation at such treatment, relapses into a sullen or confused silence, until properly regulated by an artist of the trade. It is, as has been already pointed out, almost fatal to destroy, by thinning the wood in old violins, the provision the conscientious old makers laid up for time to expend its strength upon. It is almost equally so to patch up a fiddle, which has been subjected to this destruction, with new wood ; it stands to reason that the vibrations must be very seriously impaired by a stratum of glue and a slab of new wood, whose fibres do not coincide with the rest of the instrument. The acme of short-sighted and destructive repair is reached in a case which occurred, according to Mr. Davidson, at the beginning of this century. He mentions the case of a Scotch amateur, who being possessed of a splendid Stradivari violin of the large pattern, had it *cut down* smaller, *mirabile dictu*, at the suggestion of the celebrated J. P. Salomon. The fiddle subsequently sold for £56. Letters patent were granted to J. P. Grosjean, in 1837 (No. 7450) for coating the surfaces of violins with glue and powdered glass, to improve their tone, a practice about as intelligent as that of one, Weickert, of Halle, who, at the beginning of the century, imagining that the loss of the resinous particles from the wood of violins by reason of their age (which is the great advantage of age) was detrimental to their quality, had a practice of *soaking* violins in a mixture of resin dissolved in pine oil, to close the pores, an operation which, of course, caused complete and irremediable damage. Similar experiments have been tried to close the pores of the wood, which it is most important to have open, with white of egg and other such matters, all of which operations may be classed with the rest of the "patent repairs" I have here enumerated, and on all of which comment is needless. But they serve as warnings to the owners of valuable instruments, not to entrust their fiddles to the hands of musical quacks. If you think your violin wants anything doing to it, go to one of the heads of the profession for advice ; a respectable dealer or repairer will never do anything superfluous to your fiddle for the sake of the job; and his love of his art will be subservient to his interest in his profession. I cannot do better than conclude this chapter with a highly epigrammatic remark made by Mr. J. Pearce in his "Violins and Violin Makers," "Beware of ignorance which assumes the mask of knowledge, and of designing roguery which apes the appearance of innocence."

(*To be continued.*)

WOOD-CARVING FOR AMATEURS.

By LEO PARSEY.

III. — ORNAMENT AND DESIGN. — THE NINE GREAT STYLES.

ALTHOUGH a thorough knowledge of the various styles of decorative art is not absolutely necessary to the amateur, still it is desirable that he should have an idea of the distinctive features of each style. As the space at my disposal is too small to allow me to fully explain each characteristic of every style, I shall therefore content myself with making a few remarks on ornament and design, and then glance briefly at the nine great historic styles of ornament.

Ornamental styles may be broadly divided into two great classes—the *symbolic* and the *æsthetic;* the elements of style are also of two kinds—the pure and absolute, and conventional and arbitrary ; or natural and fanciful. There are also two provinces of ornament—the *flat* and the *round;* in the former we have a contrast of light and dark, in the latter a contrast of light and shade. It is with the latter that we have to deal in wood-carving ; and the amateur should always

bear in mind that the two great principles he has to study most particularly are shape and contrast.

In most cases where imitations from nature, such as flowers or fruit, are introduced into a design, they should be used as accessory decorations, and not as principals, otherwise there is the risk of substituting the ornament itself for the object to be ornamented, and in every case ornament is essentially the accessory to, and not the substitute of, the useful. As the motive of ornament is to render the object ornamented agreeable to the mind and eye, the details of the decoration should be kept purely subservient to beauty of effect. Let me here caution the amateur never, to overload his design with a multiplicity of details, as, by so doing, he increases the labour of production, and at the same time spoils the effect of the design as a whole.

Symmetry is such an important element in decoration that it must never be disregarded. In art, as in nature, it is the *group* that is the ornament, and not the individual; and this law must be observed by the designer. In clusters, festoons, etc., of fruit or flowers, the individuals may be arranged at random, but the cluster or festoon itself must be of symmetrical proportion.

This law of symmetry is so important that it has been stated that there is no form, or combination of forms whatever, that when symmetrically contrasted and repeated, cannot be made subservient to beauty—in fact, the whole grammar of ornament consists simply of contrast, repetition, and series. I would again impress upon the amateur designer the necessity of scrupulously avoiding an overloading of detail; he should first of all consider utility, making detail merely a secondary consideration, endeavouring at the same time so to group the details as to provide against injury by the skilful adjustment of the relieved portions to the situation or use of the decorated object.

Taste in design, I need hardly say, is of paramount importance; and no amount of mere mechanical skill can counterbalance the effect of a badly-conceived design. Strange as it may at first sight appear, it is nevertheless true, that in no popular style of ornament have purely natural details ever yet prevailed. It is true that in all the great styles, the details are largely derived from nature, but for the most part conventionally treated. A plant or natural object is said to be conventionally treated when the natural order of its growth or development is disregarded. The distinction between the natural and the conventional or ornamental treatment of an object should be clearly understood. In Fig. 17 we have an ivy leaf conventionally treated, and it will be seen that although the scroll is composed of strictly natural parts, still as no plant would grow in an exact spiral direction, the scroll form constitutes the conventional arrangement. Every design is composed of two parts—plan and details; as in a bracket, the shape of the bracket is the plan, the decorations of the bracket are the details of the design, and these details may either cover the entire surface of the bracket, or only portions of it. Decorations which uniformly cover the entire surface of an object are usually called diapers, and are commonly composed of a series of the same ornament in a vertical, horizontal, or diagonal order. Diapers, as in Fig. 18, are best suited for flat surfaces, and have the best effect when arranged diagonally. The majority of the ancient mosaics are diapers of a geometrical pattern. It appears that the first principle of ornament is repetition; take a moulding, for instance, where we have simply a measured succession in series of some one detail.

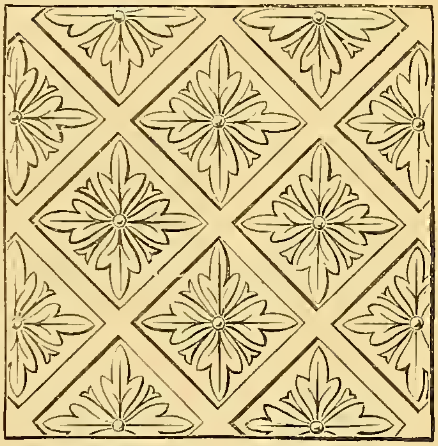


FIG. 18.—DIAPER WORK FOR FLAT SURFACES.

I will now proceed to note briefly the nine great styles into which ornament may be broadly divided, these being again subdivided into Ancient, Mediæval, and Modern. The three Ancient styles are the Egyptian, the Greek, and the Roman. The Mediæval styles comprise the Byzantine, the Saracenic, and the Gothic; and the Modern styles are the Renaissance, the Cinquecento, and the Louis Quatorze. Style is simply another name for character, and frequently is merely a modification or peculiar elaboration of the details of a previous style. To commence with the Egyptian, we find that many of the Egyptian forms of ornament are still popular—as the fret, wave-scroll, spiral, and zigzag; but the most symbolic features of this style are the winged globe, the lotus and papyrus, and the asp. Many of the forms, and indeed the very details of the Greek style, are still popular, as they so well represent the great principles of ornament, series, and contrast—contrast of masses and contrast of lines. Some of the principal characteristics of this style are the well-

known echinus, or egg and tongue (Fig. 19), the astragal, and the scrolls. In the egg and tongue we get a bold contrast of light and shade, and we have a similar result, though not so marked, in the astragal. It is now, too, that we arrive at carved, instead of painted, ornaments as in the Doric period.

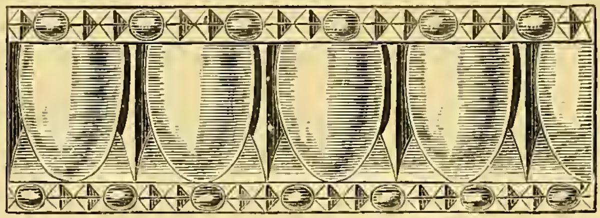


FIG. 19.—GREEK ECHINUS AND ASTRAGAL.

The Roman style is simply an enlargement or enrichment of the florid Greek—in fact, the chief characteristic of this style is its uniform magnificence. As an example of this even in details compare the egg and tongue of this period, Fig. 20, with Fig. 19. The scroll and acanthus are also peculiarly Roman, and continually occur in the ornament of this period—in fact, every form which will admit of it is habitually enriched with an acanthus clothing or foliations. The same may be said of the scroll, which, in an elaborate development with acanthus foliations, is characteristically Roman. The introduction of grotesque animal forms in ornament also belongs to this period.

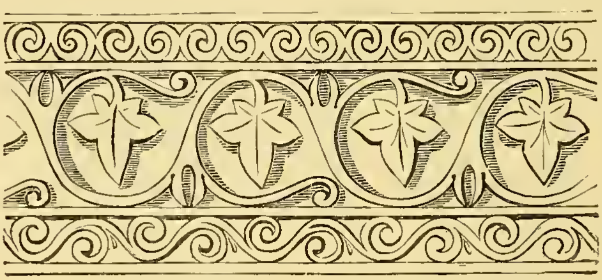


FIG. 17.—EXAMPLE OF IVY CONVENTIONALLY TREATED.

We now come to the Middle Age styles, in which we find symbols play an important part. Byzantine decorations are in nearly every case composed of ingeniously designed symbolic forms.

In Byzantine art, too, it will be found that all imitations of natural forms, and even animals and the human figure, are conventionally treated. In the decorations of this period it may be noticed that the trefoil and quatrefoil become very frequent, the former being a symbolic representation of the Trinity, and the latter of the Four Evangelists. These symbols are also common in Gothic art. The principles of the next style—the Saracenic—are soon stated. In the designs of this period we find vegetable and animal forms rigidly excluded, and curves, angles, and inter-lacings go to form the major part of the designs, inscriptions being frequently introduced. This was the period of gorgeous and elaborate diaper decorations, the habit of ornamenting the entire surfaces of their apartments affording a wide field for the display of this branch of art. The third Middle Age style was the Gothic, and this style, perhaps more than all others, should be of interest to the wood-carver.

There is hardly a cathedral where boldly-executed Gothic carvings do not meet the eye. The symbolic elements of both the Byzantine and Saracenic styles are continued in the Gothic, but are chiefly distinguished from these styles by the universal absence of the dome. In Gothic ornament the geometrical and pointed elements are elaborated as much as possible, these elements being also frequently combined with conventional treatment of animal and vegetable forms. This is one of the great features of this style, the tracery in particular being so paramount that some of the varieties of Gothic are almost entirely distinguished by this feature. We have in this style an extensive application of foliage; and the trefoil, or as it is frequently called the Early English leaf, plays an important part, and is a characteristic feature of the ornament. Gothic ornaments, independent of tracery, are nearly exclusively leaves, fruit, or flowers—classical ornaments being excluded; and there is generally a want of finish about the details.

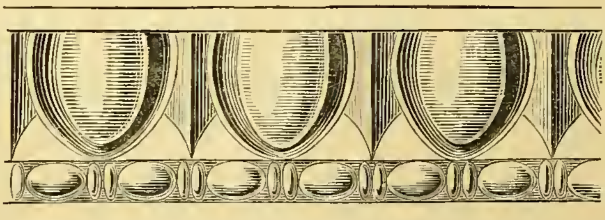


FIG. 20.—ROMAN ECHINUS AND ASTRAGAL.

We now come to the Modern styles commencing with the Renaissance, the principal features of which are intricate tracery and delicate scroll work of conventional foliage. The mixture of various elements is also one of the essentials of this style, men and animals, natural and grotesque, conventional and natural foliage, tracery and scrolls—all forming part of this mixture. The Renaissance in fact is rather a combination of various styles than a revival of any particular style.

Cinquecento is the next style, and this, as a development of art, is the most perfect of the modern styles. The arabesque scroll work, with its graceful pleasing curves, is a prominent feature of this style, and with this it combines unlimited choice of natural and conventional imitations from both the animal and vegetable kingdoms, either arbitrarily disposed or combined. All the efforts of this, the culminating style in ornamental art, are made to attain the most attractive results and to gratify the eye. We now come to the last of the Modern styles, the Louis Quatorze. In this style great contrasts of light and shade were its most striking characteristics, and to obtain this result exact symmetry in the parts was no longer essential; consequently, in some examples of this period we find symmetry avoided both in the balance of the whole and in the details of the parts. The individuality of this style is in the constant and peculiar combination of the scroll and shell, the other elements of the style being classical. We find also that the broad acanthus foliations have become more elongated, and that flat surfaces are not admitted into any of the designs of this period—in fact, as sudden and varied contrasts of light and shade are so essential an element of this style, all the ornamental details are either concave or convex.

I have endeavoured in these brief remarks on the various styles to give the amateur some slight idea of the most characteristic features of each, by which he may distinguish the one from the other. In my next article I intend giving designs and instructions for their execution; the designs will necessarily be simple, the primary object being to accustom the carver to the use, and to give him perfect command of his tools.

(*To be continued*).

OVERGLAZE PAINTING ON PORCELAIN.

By AURELIO DE VEGA.

CHAPTER I.—Comparison of the Advantages of Overglaze and of Underglaze Painting—Porcelain and its Glazes as affecting Painting—Scope of the Amateur's Work.

ANTIQUITY *of Pottery Ornamentation.*—The decoration of articles made of clay is one of the evidences of that longing for ornament of some kind or other, which seems to be inherent in man, and we accordingly find that the art of producing on clay-ware, in such a manner that the result should be permanent, devices of a colour different from that of the ware, is prehistoric; the earliest records on this point being in fact induced by the circumstance that excellence had already been achieved in the art.

2. *Superiority of Porcelain to Earthenware.*—For our purpose clay goods may be divided broadly into two classes—opaque and translucent: the former comprising earthenware, majolica, and the like; the latter, porcelain or china. The worth of earthenware may vary between that of the commonest clay crock and the finest piece of stoneware, or majolica; but the value of porcelain, which is of a superior basis, of a more delicate texture, and more expensive to produce, varies within comparatively small limits. That is, of course, at the time of production, and with due regard to the amount of work entailed in forming the object into which it is to be made. The specimens which realize such extraordinary prices among collectors have an enhanced or a spurious value from being ancient or typical, or from the mere determination of a person to become the purchaser. My remarks upon decoration are made primarily with reference to porcelain; not simply because it is the finer and intrinsically more valuable material, but also, and principally, because upon it work more excellent in appearance can be produced. At the same time it will be understood that they apply also to earthenware.

3. *Underglaze and Overglaze Painting compared.*—Ceramic painting is of two kinds, underglaze, and overglaze. The former is executed on the bisque, by which name the ware is known when it has received its first firing, and before it is glazed; the latter is, as its name implies, done upon the glaze, or that glassy surface which gives such lustre to the ware. Each of these modes of decoration has its ardent apologists. Accordingly, it is as well at the outset to admit that of the two kinds, an underglaze painting when executed with the touch which should be employed, and when strictly achieving its true aim, is undoubtedly the finer, comparing as it well may, for effect, with the finest oil-painting. Such a work as this is practically imperishable. On paintings made with, and on, other materials, time lays his finger to their ultimate effacement or decomposition; but an underglaze painting will endure in all its completeness and beauty as long as the ware, on which it is done. An overglaze would, considering the care which would naturally be taken of it, be perhaps but little less enduring; the difference being, that in the former case the colours become united to the body itself, their beauty being developed by the overlying glaze; in the latter, they unite with the glaze only. In addition, as regards appearance, the overglaze picture does not, as a rule, present that crispness and boldness which distinguish the perfect underglaze work.

4 *Advantages of Overglaze Painting.*—The foregoing concessions have been made in order that it may not be supposed it is desired to unduly enhance subsequently the value of overglaze work; but, having been

made, due recognition can be given to the superior claims of such work to the attention of the average amateur. These are numerous and important.

(*a.*) The scope of underglaze work is limited by the smaller number of colours available. In order that the bisque painted in oil may be brought into a condition to take the glaze, it is necessary that it should be raised to a red heat, so that the whole of the oil, which would of course refuse to combine with the glaze, which has a watery medium, may be dissipated. There are, however, only a few of the pigments obtained from the same sources which supply those for overglaze work, that can, after passing through such an ordeal, resist the action of the constituents of the glaze; some changing in tone or tint, others disappearing altogether. Hence overglaze work has the great advantage of a much wider selection of colours, and consequently a more extended range of subject.

(*b.*) Not only are underglaze tints less numerous than overglaze, but with a few exceptions, they do not comprise those brilliant, not to say gorgeous hues, which can be produced in the latter, and which are so essential in certain styles of decoration. An underglaze painting is, generally speaking, quieter than one done over the glaze; and hence, frequently, with a view to perfect the effect sought to be attained by work on the bisque, the assistance of enamel colour on the glaze is called in.

(*c.*) Overglaze work does not make such demands upon the judgment of the painter as does underglaze. In the case of the latter, the hue of the pigment as laid on is very often entirely different from that developed in the glazing; whereas, in the former case, the colour laid is, as a rule, the same as that which will appear fixed after the firing. There is frequently also, in underglaze work, a difficulty to determine the exact depth of colour employed, which when at all existent in overglaze, is so to only a very slight extent. And, generally, overglaze work is less troublesome than underglaze.

(*d.*) The expense of glazing is considerably greater than that of simply firing, which is all that is necessary to fix the painting in overglaze work.

Hence it is abundantly evident that for the amateur whose desire is presumably to produce, with a view to decoration, an effect brilliant as well as artistic, painting in overglaze or enamel colours offers at once the wider and cheaper, and, practically, equally enduring means of gratifying his wishes.

5. *Prospectus.*—The remarks which follow will be found to afford, so far as is possible in writing, a complete course of instruction in all that essentially appertains to overglaze painting. It will be readily understood that written directions, considered alone, sometimes fail—taking for example the subject of matching tints—to bring about the *exact* result desired or described. The earnest student, however, fairly appreciative, and possessed of ordinary powers of perception, will meet with a full and sufficient guide to enable him to embody his ideas in colour.

I propose to consider in order the nature of porcelain and its glazes, and the mode in which the latter affect the appearance of the painting ; the scope of the amateur's work ; the apparatus and appliances necessary or profitable to employ ; and the vehicles which should be used in laying the pigments. A work will then be undertaken in monochrome, or one colour shaded either with itself or with some allied colour; in carrying this out the several processes best adapted for outlining and laying the background under different circumstances will be reviewed. A detailed description will then be given of the standard colours, or those in regular use, and ordinarily procurable, of their mutual behaviour in mixtures, and of the manner in which composite tints generally may best be obtained, and with this information in hand work in colours will be commenced.

6. *Porcelain and its Glazes.*—In order that greater discrimination may be exercised in subsequent operations, it is desirable that the nature of porcelain and its glazes should be understood. I do not propose to give a history of pottery, or a detailed description of the processes employed in the production of that beautiful ware now so easily and cheaply obtainable. Such a course would serve no useful purpose. A section on the subject would be highly interesting, but the greater portion of the information it would afford would be of no practical avail, and complete descriptions are readily attainable in public libraries, and are more fittingly found in the pages of an encyclopædia, or a Dictionary of Art or Manufactures than in a paper of such a series as this, the main object of which is the satisfaction of the wants of the practical amateur *painter.* It is, however, essential that the painter who is desirous of attaining something more than mere mediocrity in his art, should be possessed of correct information respecting the two particulars to which I have just referred, as without this knowledge it is very probable that he will fail—however well he may have worked—to realize his ideal, seeing that similar work executed with equal care upon two glazes of different descriptions may produce results so entirely different, that in one case the liveliest satisfaction may be experienced, in the other the keenest disappointment.

Porcelain, then, is of three kinds, technically known as *Hard*, *English*, and *Soft*, the last being also called *tender*, or *spurious*, and the first also *genuine.*

(*a.*) *Hard Porcelain.*—The body of hard porcelain is essentially composed of two substances, both of which occur naturally : 1. Kaolin, or as it is called in

England, China clay, an argillaceous earth, the most valuable beds of which have been found in China and Japan, in Saxony, in France near Limoges and near Bayonne, and in England in Devon and Cornwall—the English variety resembling the Chinese and Japanese rather than the Continental; 2. China stone, a quartzose felspar, here called Cornish stone. These two substances occur in the formation called "graphic granite," but whether they have resulted from the decomposition of the granite, a further stage having been reached in the case of the former than in that of the latter, or whether they are constituents of imperfectly formed granite, the latter being more developed than the former, is not yet determined. Their origin is, however, noticeable as they are causative of the hardness of the ware. By whatever means brought about, the important point is that the stone contains a large portion of alkaline matter, but little of which exists in the clay, and is accordingly fusible, or capable of being reduced to a molten mass, while the clay is infusible, or under heat retains its earthy character, and becomes of a brilliant opaque whiteness. The stone thus acts as a flux to the clay, and it is to this flux that nearly all hard porcelain owes its translucency.

The principal seats of this manufacture are the district round Limoges and Sèvres. Hardware is also made in districts bordering on the Rhine (Sarreguemines, Saarlouis, Vaudrevange, Mettlach, Maastricht), at Meissen (Dresden), Berlin, Vienna, St. Petersburgh, etc. The Chinese and Japanese ware also belongs to this class. In England hard porcelain was first made by Cookworthy at Plymouth (A.D. 1760), subsequently at Bristol, and later at some of the Staffordshire works.

(*b.*) *Soft Porcelain.*—It will be more convenient to notice next the soft porcelain. This a French make. The principal portion of the body is practically a glass. The vitrifying materials (sand or flint, gypsum, and saline and alkaline ingredients) are fritted, that is, melted, cooled and pulverised, and then mixed with the infusible body which is a white marl. The proportions being three parts of the former to one of the latter, the softness of the ware is at once recognized. It is principally used for statuettes, vases, and such like articles.

The most perfect examples of this kind of ware are found in the old Sèvres ware. Of this kind also was the ware produced in England, up to the time of Cookworthy, at the factories at Chelsea, Bow, Worcester, Derby, Caughley, Colebrook Dale, Nantgaru, Coalport, Swinton, Lowestoft, and other places.

(*c.*) *English Porcelain.*—The English porcelain differs from the hard in the introduction into the body of a large proportion of calcined bones, the effect of which is to render it better able to resist great heat and sudden changes of temperatures, and to give it a place as regards hardness between the other two kinds. Three descriptions are made—one for ordinary table use, one more delicate for dessert and the better tea-services, and the third, somewhat softer, for *objets d'art.*

The innovation which gave character to this ware was the work of Josiah Spode, who succeeded his father in 1797, and since it was generally accepted by the English makers, similar ware has been regularly made in our factories. There are some forty makers of acknowledged repute, but Messrs. Copeland (Stoke), Minton (Stoke), Davenport (Longport), Rose (Coalport), Brown-Westhead (Caulden Place), and the Royal Worcester and Crown Derby Companies, deserve special mention for the fineness and purity of their wares.

(7.) *Glazes,*—(*a*) *Hard.*—As with the wares so with the glazes, there is great variety. The hard porcelain admits of no metallic constituent in its glaze, which is composed solely of ground felspar or Cornish stone, with sometimes an addition of gypsum. These materials require for their perfect vitrification a very high heat, or, as it is called, a *hard fire*, and the glaze is therefore exceedingly hard.

(*b.*) *Soft.*—The glaze for the soft ware is a specially prepared glass of the crystal kind, containing about two-fifth parts of lead oxide. Incipient fusion takes place, therefore, at a comparatively very low temperature.

(*c.*) *English.*—The English glaze, like the English ware, occupies a middle place. It is so far like the hard that it contains a large proportion of felspar, but like the soft it contains lead. In this case, however, the metallic element is only about one-fifth of the whole. From the artist's point of view the approximation must be regarded as inclining towards the soft rather than towards the hard.

8. *General Test for Hardness.*—To complete the differences which we have now noticed in our goods, it is only necessary to add that the soft ware is, as a rule, of a slightly dingy and yellowish tint, and is more transparent than the other kinds, and that the glaze may easily be scratched with the point of a penknife. A very practical test is that boiling water heat when suddenly applied is generally sufficient to crack it, but this I fancy will be seldom tried.

9. *Effect of the Glaze upon the Painting.*—We are now in a position to form an opinion as to the extent of the influence which any particular glaze will have upon the appearance of the work done upon it. It follows, from what has been said, that the harder the ware and its glaze, the more superficial is the latter; while the softer the ware and the more like it its glaze, the more complete and intimate is the incorporation of the two. In the case of the hard ware the glaze is,

strictly speaking, only *attached* to the ware, in that of the soft the flux is practically *a continuation of the glaze.* The mode in which these conditions operate upon the painting is immediately obvious when it is stated that the pigments are of a vitreous nature or are mixed with a vitreous vehicle. The harder the glaze, the more superficial and less glossy is the painting; the softer and thicker the glaze, the more deeply does the colour sink into it. I have an old Augustan (Dresden) cup and saucer, one of the colours employed in the decoration of which has absolutely no union with the underlying glaze, and is secured only by its connection with the colour surrounding it. It has properly vitrified, but has not become incorporated with the hard glaze which appears in some spots where the colour has chipped off. Compare such a work as this with a painting executed upon a piece of old Sèvres, and how striking is the difference in the appearance of the two. In the former the colours are in large part hard in appearance and dryish, and generally lack that full and perfect gloss to be found on the latter, which presents a velvety softness of look. The reason is clear. The degree of heat adapted to reduce the pigments to a proper state of fusion is insufficient to affect the hard glaze to a corresponding extent, and the paint remains on the surface and looks more or less *dry*. If the glaze is sufficiently hard some colours may altogether fail to adhere, and the work of the painter, who by mistake has selected a piece with such a glaze, be entirely thrown away. The softer glaze, on the other hand, yields to the heat sufficient to vitrify the pigments, and so these sink more or less deeply into the body of the glaze, thereby acquiring that peculiar depth and richness of tone, which have given such charm and value to the old English and French wares. This very peculiarity, however, limits its range of usefulness, as it is only suitable for certain kinds of decoration in which rich and very showy colours are required to be used pure. The English glaze, from the middle position which it occupies, possesses most of the advantages of the soft, and practically none of its disadvantages, and while but little less suited than the latter for the particular work just indicated, is best adapted for every other kind of work, and is therefore to the painter an invaluable description.

10. *Scope of the Amateur's Work.—Special Position of the Amateur.*—Having thus dealt somewhat fully with the special characteristics of the different kinds of wares, and of their glazes, and also noticed the effect of those glazes on the work, it will perhaps be well to say a word or two upon a subject with regard to which much misapprehension exists. This is the nature of the work which an amateur may advantageously undertake. It is popularly supposed that because a person does certain work himself, the result is the cheaper by the cost of the labour of whoever would otherwise do it. This is not always the case, and in nothing is it less so than in certain branches of china-painting.

The productions of the ordinary painter, whose wages are low, are in the style of the 18s. 6d. dessert service, "ornamented with every variety of fruit and flower, magnificently painted by hand," as the advertisements read. Such a man is very useful in his way. In certain lines, indeed, such as call for rapid production and regularity, he cannot well be dispensed with, but with work which demands special artistic ability it is otherwise; the high-pressure rate at which he works precludes the possibility of his improving upon the peculiar style referred to, and that is scarcely, I think, the style which we should like to see exemplified upon our walls or our furniture, or in an article which we would offer as, say, a birthday gift, or a present in token of friendship or gratitude. From him we go by a step to the pottery-artist; but his work is really good, and being, as a rule, expensive, is within the reach of comparatively few. Now it may be presumed that the general amateur enters upon the study of china-painting, primarily with the view of affording pleasure to himself, and his friends and relations, and herein lies his great strength and the advantage of his position, for he can leisurely devote his energy to the attainment of excellence in any special line for which he has aptitude, and so may develop therein an individuality from which his work may acquire a high intrinsic value in addition to the estimation in which, if it becomes a gift, it may be held from its associations.

11. *Principle of Selection.*—These considerations reveal the principle which should guide the amateur in selecting his work, if he would not be at a loss both of time and of money. He must emulate the true artist, not the mere painter. He must engage in work which appeals to his head as well as to his hand, not in what is only routine or mechanical.

What to Avoid.—At the pottery there is opportunity for the greatest economy in the use of paint, and every convenience is at hand for firing the painted article with the least delay, as often as may be necessary, and at the smallest expense. Hence, in the painting of a tea, coffee, chocolate, dinner, dessert, or toilet-service, which may have to be fired more than once, and which consists of several pieces, the decoration of each of which may be after a set design of whatever kind, it will be found that the work can be done better, more cheaply and more quickly at the factory, than at home—the standard of work being of course regulated by the cost.

What to Undertake.—If, however, the work be

intricate—other than mere repetition of detail—or fanciful, or of such a nature that the time which would be occupied upon it by the pottery artist, and by the amateur who has achieved some facility in the use of his brush and colours, would be about the same, or generally of strictly limited interest, the advantages are altogether on the side of the latter, whose taste and fancy may be exercised on objects of the greatest variety. Among the pieces to be had are spill-vases, flower-vases, flower-pots, breakfast-cups and saucers; especially, if I may make a suggestion to some fair student, moustache-cups, often most acceptable to tbe recipient; dessert and tea-services in which the decoration is elaborate, or contains much miniature or variegated gold work, afternoon tea sets, plaques of various shapes, round. oval, oblong, or square, and suitable for pictures for wall-decoration, such as scenery, or family portraits, for covers for albums, for inlaying in clocks and cabinets, or for setting as brooches or in bracelets, dishes for the wall or for setting as card trays, dress buttons, solitaires, etc., etc. These, and the paintings on them, might be all objects of special interest; and the articles named are only a few of those which the amateur may decorate with most advantage.

In the next paper the subject of material and apparatus will be entered upon.

(*To be continued.*)

ORGAN BUILDING FOR AMATEURS.

By MARK WICKS.

I.—SPECIFICATIONS—NEW METHOD OF MAKING PIPES.

THERE are few things that possess more fascination for the amateur mechanic than a musical instrument, and few, indeed, that, if the work be well carried out, will so fully reward him for his patience and labour. The organ, that acknowledged king among keyed instruments, is of such construction that every portion of it may be made by a person possessing a little skill and a fair amount of patience and ingenuity. In this respect it differs from the piano or harmonium, as in those instruments the really music producing portions would not be placed to the credit of the amateur, but would necessarily be purchased, whereas every pipe in the organ could be made by the amateur himself.

The very small organ described in the previous pages of this magazine, having excited much interest in the subject; I, therefore, now propose to give such instructions as will enable amateurs to build themselves a really useful instrument, that may be a source of pleasure to themselves and their friends for many years to come. As the basis to work from I shall describe a specific instrument, and add such information as may be requisite to enable the amateur to build either a smaller or a larger instrument, as the length of his purse may permit. I would here urge upon all intending workers that, whatever scheme they may adopt, they should keep to, and work away at it steadily until all is completed, for many commence upon work which they have not sufficient patience to carry out, and, consequently, they never have anything to show for the time and money which they have expended.

The specification for the instrument to be described is as follows:—

1. Open Diapason to Tenor C	...44 pipes	...8 feet tone.
2. Stopt Diapason, Bass	...12 ,,	...8 ,,	,,
3. Stopt Diapason, Treble	...44 ,,	...8 ,,	,,
4. Flute (for Principal)	...56 ,,	...4 ,,	,,
5. Keraulophon (small scale to Tenor C)	..44 ,,	...8 ,,	,,
6. Flageolet (for Fifteenth)	...56 ,,	...2 ,,	,,
7. Bourdon (pedals)	...25 ,,	...16,,	,,
Total,	281 pipes.		

Couplers: octave; great to pedal.

The whole to be enclosed in a general swell. Size about 6 feet 6 inches wide, 9 feet high, and 3 feet deep.

If the Bourdon were omitted, it would reduce the size of tbe instrument considerably; or a nice little instrument could be made by having the first four stops only.

For a two-manual instrument, the following would be a good specification:—

Great organ—			
1. Open Diapason to Tenor C	...44 pipes	...8 feet tone.	
2. Stopt Diapason, Bass	...12 ,,	...8 ,,	,,
3. Principal (flute)	...56 ,,	...4 ,,	,,
4. Flageolet	...56 ,,	...2 ,,	,,
Swell organ—			
5. Lieblich Gedact	...56 ,,	...8 ,,	,,
6. Keraulophon to Tenor C	...44 ,,	...8 ,,	,,
Pedal organ—			
7. Bourdon	...25 ,,	...16 ,,	,,
Total,	293 pipes.		

Couplers: swell to great; great to pedal.

Same size as No. 1, but 6 inches deeper.

A smaller two-manual might comprise the following stops:—

Great organ—			
1. Open Diapason	...44 pipes	...8 feet tone.	
2. Stopt Diapason, Bass	...12 ,,	...8 ,,	,,
Swell organ—			
3. Lieblich Gedact	...44 ,,	...8 ,,	,,
4. Flute (for Principal, small scale)	...44 ,,	...4 ,,	,,
Total,	144 pipes.		

Couplers: swell to great unison; octave on great.

The pedal-Bourdon may, or may not, be added, according to the will of the amateur. If it is, a coupler, great to pedals, would be needed.

The intending organ-builder has thus several schemes to choose from; and, as the dimensions of the sound-board and all other portions will be fully set out in the succeeding articles, he will be enabled to find all the dimensions he will require. The scales for the pipes will be the same for each organ.

It will be noticed that in neither of the above specifications have I mentioned the materials of which the pipes are to be made, and my reason for not doing so is, that I have worked out a new method of making them, and now propose to give the amateur the benefit of my experience. Many who would much like to build an organ are deterred from doing so by the great outlay necessary to purchase the pipes; but it is now open to anyone, by following my instructions, to make the whole 281 pipes required for Scheme 1, for a very much smaller sum than would be required to purchase the open diapason alone. That stop, in metal, would cost about £5 to purchase, a wood stopped Diapason, £8 15s.; a Bourdon, about £11 or £12; Principal, metal, £5 10s.; Keraulophon, £6; Flageolet, £3 10s.;—thus running up to something like £40 for the pipes alone. For pipes made on my system, about 10s. for each stop will cover the cost, and leave a margin. The Flageolet will cost less than 5s.

Many of my readers will no doubt smile incredulously when I state that the pipes are simply made of paper; but I can only assure them that they answer thoroughly, and I have spent years in making various experiments for perfecting them. The idea, I believe, is not a new one, but I am not aware that it has ever before been practically worked out, and, indeed, it was the ridicule cast on the idea by would-be knowing ones that induced me to persevere with it until I succeeded. All pipes up to 2 feet long may be made of cartridge paper, but for longer pipes stout brown paper is the best.

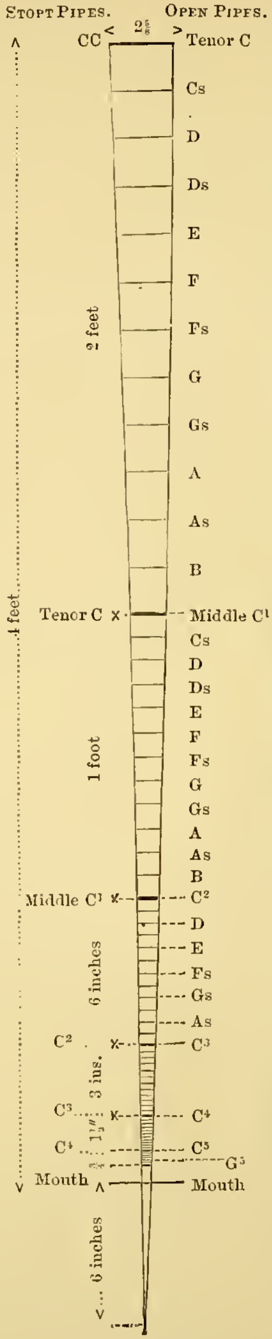


FIG. 1. — THE SCALE. $\frac{1}{8}$th full size.

The advantages I claim for my system are, that it is very cheap, far cheaper, in fact, than any system ordinarily followed, as the prices above quoted will show; that the pipes are exceedingly light, a 4-foot stopt Diapason weighing about twenty ounces, or an open pipe the same size fourteen ounces, which will contrast very favourably with the weight of metal or wood in a similar pipe. They are easy to make, an amateur being more likely to succeed with these than with ordinary pipes, as they require but little skill, and no expensive tools; and having, practically, no join throughout their length, there is no long glue joint, as in wood, or soldered joint, as in metal pipes, and, consequently, no risk of leakage. They take up only the same room as metal pipes, though they are much stronger, and cannot so easily be damaged by rough knocks, and any form of pipe can be made; and last, but not least, you can try your pipes before completing them, and will thus be sure that they will answer.

Before starting on the pipes, set out the scale for them in the following manner: on a nicely-planed board draw a line 4 feet 6 inches long, and at right angles to the top of this line draw another, 2⅝ inches long, and join the end of the short line to the bottom of the long one by a sloping line; 2 feet below the top line draw another thick line across from the long line to the sloping one, 1 foot below that draw another, 6 inches below that draw another cross line, and others at 3 inches, 1½ inch, and ¾ inch, one below the other. Mark a C against each of these cross lines, and 6 inches from the bottom set off a thick line and mark it with the word "mouth." Now divide the spaces between each C into twelve equal parts; the top one will thus be divided into twelve spaces of 2 inches each, the next one into spaces of 1 inch, the next into spaces of ½ inch each, and so on, each set being exactly half the size of the preceding one. Against each of these lines write the names of the notes in the same order as I have shown them in Fig. 1, only I have not been able to show them all through as the scale is too small to admit of it. To find the size of any pipe, you measure from the line marked "mouth" up to the cross line against which is the name of the required note; this gives you the speaking length of the pipe, and the

length of the cross line is the interior diameter of it, and so you will proceed to find the size of any pipe you may require up to 4 feet long.

It will be best for the amateur to make a small pipe or two, for experiment, before he starts on the set for the organ. A convenient size to commence with will be the G2 in the treble of the open diapason. This pipe, as you will find from the scale, is $8\frac{1}{2}$ inches speaking length, and about $\frac{11}{16}$ inch diameter. You will require a mandrel to form it upon, and my method of making this is cheap and simple, viz., take a sheet of stout, smooth paper, 12 inches wide, and roll it up tightly until it is $\frac{11}{16}$ inch diameter (the size required for our pipe), taking care that you roll it straight, and have the ends square, or your pipe will not be a true cylinder, but slightly conical. When you have rolled it to the right size, glue the edge down smoothly, and let it dry, which will only take a few minutes. If you have used a sufficient length of paper, you will now have a perfectly round straight firm mandrel to work on. I may say that an ordinary round lead pencil will answer very well for starting the rolling up. Now cut a piece of nice smooth cartridge paper 9 inches wide, and long enough to go four times round the mandrel, this will take about 9 inches. Cut the sides of the paper perfectly square, and then roll it once round the mandrel and mark that distance by a pencil line, take it off, and then with a brush full of hot, thin glue go over all the rest of the paper up to the pencil line; allow the glue a minute or so to soak in and the paper to stretch, and then carefully roll it round the mandrel, rubbing it well down with the fingers, or a small, round stick (the lead pencil will do very well) as you roll it up. When it is all rolled up, roll it between your hands on the table, like a cook rolling out dough, and rub the joint well down, and also rub the pipe all over with the round stick. Slip it off the mandrel (there being no glue on the first turn it cannot stick to it), and stand it up on end to dry, and it will be a tube 9 inches long, $\frac{11}{16}$ inch internal diameter, perfectly straight and smooth inside and out. All this can be done in less time than it takes me to write the directions.

While the tube is drying, you may make the conical portion for the foot, this being formed of a piece of paper shaped as in Fig. 2, about 9 inches wide and 8 inches deep. Commence rolling it from the top corner as shown by the dotted lines in the sketch, and when rolled up it will assume a conical shape of any diameter you may like to make it. Unroll it, give it a coat of thin glue, and when it has had time to stretch, roll it up again, rubbing it well down, inside and out, with a pointed stick to make each layer adhere thoroughly. When this is completed you will have a conical tube like Fig. 3, running almost to a point at one end, and irregular at the top. The outside join should be a straight line right down the cone, not winding round it; the paper can be cut so as to ensure this just before you finish rolling it up. When this is dry, both the tube and the cone must be painted or varnished inside. Though it may seem rather a difficult job to paint the inside of so small a tube, it is, however, quickly and easily accomplished by tying a piece of sponge on to the end of a thin cane or wire, so that it forms a kind of mop that will just go into the pipe; dip this in the paint and work it up and down the inside of the pipe two or three times, and the job is done in less than a tenth of the time it would take with a brush, and securing a much smoother coat of paint. The cone may be painted with a smaller mop, or a fine brush.

The paint must be allowed to get thoroughly dry, and then you may trim off the top and bottom of the pipe with a pair of small pointed scissors, and trim off the top of the cone in the same way till it is exactly the same diameter as the tube, then rub the ends of the pipe and the top of the cone perfectly level on a piece of glass-paper stretched over a block of wood covered with cork. Cut out a flat piece of mahogany or cedar $\frac{1}{10}$ inch thick to the shape shown in Fig. 4, the straight part being two-ninths of the circumference; the top and bottom edge of this straight part should be slightly rounded off with fine glass-paper. This circular piece, which is called the languid, should just fit the bottom of the tube on which you may now lay it, and mark where the ends of the straight part come, then cut a three-cornered piece of that width, and about 1 inch long out of the tube immediately over it, as shown in Fig. 6. A piece must now be cut out of the front of the cone, but the gap must be slightly narrower, so that, when it is placed against the end of the tube, the front of the cone will project slightly beyond it, to allow for the windway. A piece of thin mahogany, or cedar, shaped as in Fig 5, is cut to fit on the top of the cone. Lay the tube on a piece of glass-paper so that the part where the piece is cut out lays flat on the paper, and rub it down level, and proceed in the same way with the cone. Cut out two pieces of wood like Figs. 7 and 8; the first piece is chamfered on the front to form the upper lip, and the other is just rounded off at the top edges to form the lower lip. Glue the languid on to the bottom of the tube, and the under languid on to the top of the cone; when dry you may bind on the upper and lower lips in their proper position with a piece of narrow tape. The height of the mouth is about a quarter of the diameter.

You may now place the cone and the pipe together in their proper position, leaving a narrow windway between the straight edge of the languid and the

lower lip; hold it in that position and blow gently through the pointed end of the cone, and you will be rewarded by a musical note. If the note is not quite satisfactory, the upper lip may want shifting a little higher or lower, or the lower lip may require a little shifting. The top of the lower lip should be level with the top of the languid, or but very slightly below it. The windway should be about wide enough for a piece of thin playing card to pass. On the front edge of the languid, fine nicks should be made in a slanting direction with a fine penknife: about twenty to the inch for this pipe—this is the voicing. Mark on the pipe the height of the mouth, then take off the lips, glue them and bind them in their places with tape. Even in the matter of binding on, there is a right and a wrong way; the proper way being to bind with both ends of the tape, so that it crosses down the centre of the lip, you will then get the edges of the lip parallel with the edge of the languid. This is a point to be gained, as, if it is not parallel, the note will be faulty, either squeaking or chiffing, as it is termed, before it speaks the proper note. If it is satisfactory you may now glue the foot on to the tube and stand it up, and when dry, rub down the sides of the lips and round the joint of the languids with glass-paper to make it look neat. Cut a piece

FIG. 3.—THE CONE IN THE ROUGH, SHOWING WHERE IT IS TO BE TRIMMED DOWN.

FIG. 4.—THE LANGUID. FULL SIZE.

FIG. 5.—UNDER LANGUID. FULL SIZE.

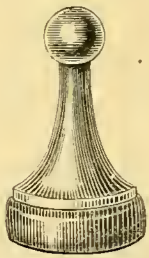


FIG. 10.—WOODEN STOPPER WITH LEATHER ROUND THE LOWER EDGE.

FIG. 2.—SKETCH OF FINISHED PIPE. DRAWN TO HALF FULL SIZE.

of glazed dress-lining as in Fig. 17, the marks show where it is to be cut to make it lay even on the cone, and glue it round the joint of the pipe, to strengthen it. There may be a little piece of the pipe projecting on each side of the mouth, which should be taken off with a sharp penknife. This is the smallest pipe that will require ears, which are simply pieces of veneer shaped as at A, in Figs. 12, 13 and 15, and glued on to the pipe against the edges of the lips, so that no wind may be lost. They will want chamfering on the edge where they are glued to the pipe, to make them fit on; this may be done with glass-paper.

Cut off the bottom of the foot to the size required, about 5 ins. will be long enough, and chamfer it off at the bottom about $\frac{1}{4}$ of an inch with a sharp knife. This chamfer has now to be coned in, just the same as metal pipes are, a metal cone being used for them; but the amateur need not lay out 7s. 6d. in buying a metal cone, as a common china egg-cup costing a penny, will answer the purpose equally as well. The under part of the foot will do to cone small pipes, and the cup itself will be used for large ones. You have merely to wet the chamfered part with your lips, place the foot of the egg-cup on it, and work it gently round with your hands till it is coned in sufficiently. The hole should come in the centre of the coning,

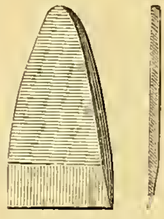


FIG. 7.—UPPER LIP. FULL SIZE.

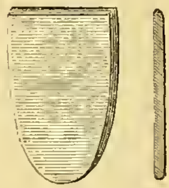


FIG. 8.—LOWER LIP. FULL SIZE.

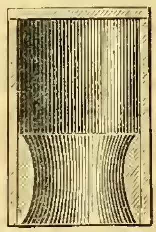


FIG. 9.—SECTION OF CAP OF STOPT PIPE.

FIG. 6.—SKETCH SHOWING LANGUIDS IN POSITION, AND HOLES CUT READY FOR LIPS TO BE PUT ON.

and is about $\frac{1}{16}$ of an inch in diameter for this pipe; it may be made quite round by inserting the point of a lead pencil. When dry, the coning is quite hard, but the hole can be enlarged with the pencil, or closed with the coning cup, as may be required, to admit the proper amount of wind. Trim down the top of the pipe with the scissors until it speaks rather too sharp a note; then make a short piece of tube about 1 inch long that will just fit on the pipe, and slide easily up and down. This is the tuning piece; raising it will flatten, and lowering it will sharpen the tone. The appearance of the pipe will be improved if you chamfer off the top edge and the top and bottom edges of the tuning cap. Give the pipe and slider two or three coats of oil paint to preserve it, and it will now be finished. The experience gained in making this pipe will be very useful, and you will very soon acquire the method of manipulation, so that you can go to work with certainty. Making a single pipe takes some time, as you have to wait about for the parts to dry, but when you commence on the sets of pipes required for the organ, you will find that no time need be lost.

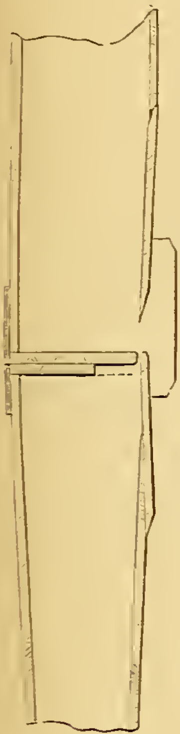


FIG. 12.—SECTION OF PIPE. FULL SIZE.

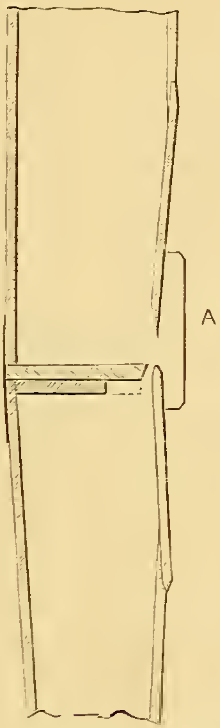


FIG. 13.—SECTION OF PIPE WITH INVERTED MOUTH.

FIG. 14.—FRONT VIEW OF STOPT DIAPASON. SHOWING ARCHED UPPER LIP.

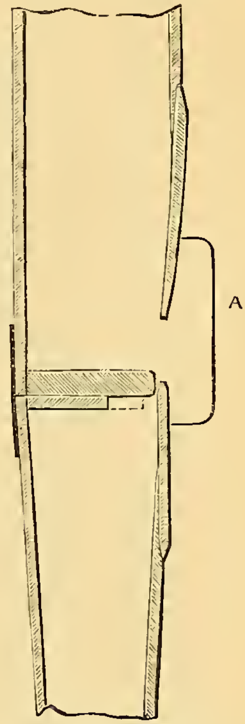


FIG. 15.—SECTION OF STOPT DIAPASON SHOWN IN FIG. 14.

FIG. 16.—METHOD OF CUTTING OUT THE LIPS.

FIG. 17.—THE LINEN BAND.

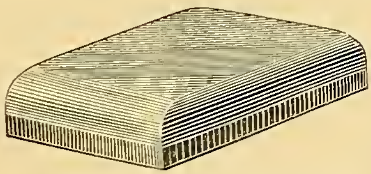


FIG. 18.—BLOCK COVERED WITH CORK FOR USING WITH GLASS PAPER.

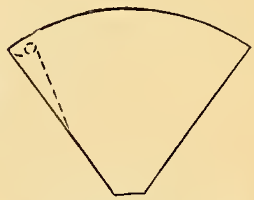


FIG. 11.—SHAPE OF PAPER FOR MAKING CONICAL FOOT.

The first thing you will require to make will be several mandrels, say one for every fourth pipe; make them considerably longer than the pipe to be formed on them, for one mandrel may be used for more than one pipe. It is a maxim in organ building, that each stop should be of a different scale, but it will only be necessary to make one scale for these pipes, except

the bourdon and the lowest octave of the stopt diapason.

The scale as it stands is for the open diapason, the stopt diapason treble will be one scale larger, that is the C of that stop will be made on the B mandrel of the open pipe, and so on. The flute, or principal, will be one scale smaller than the open diapason, the flageolet may be two scales smaller, while the keraulophon will be six scales smaller ; thus we may proceed with the tubes for all the pipes simultaneously. Having cut the sheets of paper to the necessary size, allowing sufficient length in each pipe to cut off the tuning pieces—as the piece cut off one pipe will fit on to a smaller one and thus save having to make separate pieces—mark the distance of one turn round the mandrel by a pencil line on all of them, and mark them also with the name of the note of the pipe they are intended for. Suppose you start on 6 inch C, open diapason, you glue that sheet and lay it aside, glue another sheet for $6\frac{1}{2}$ inch B for the flute, and another for $5\frac{3}{4}$ inch Cs. stopt diapason. Now take up your first sheet and roll it round the mandrel, proceeding in the same way as with the experimental pipe ; when finished draw it off and stand it up to dry, roll up the second sheet, and slip that off, then proceed with the third. The reason for doing three sheets at a time is that it allows just sufficient time for the paper to stretch and the glue to get right for rolling up. You then glue three more sheets, viz., 7 inch As. piccolo, the 9 inch Fs. of the keraulophon, and one of the sheets for another mandrel, thus you can keep on making these tubes at the rate of 20 or 30 an hour when you get used to it, and have all the stops in hand simultaneously. Mark each pipe in ink with the name of the note and the stop it belongs to, so that you may be able to keep each stop separate. When you have made all the pipes you require on one mandrel, roll more paper round it and glue the edge down, to bring it up to the proper size of the next pipe, and so proceed till you have made all the tubes. Use cartridge paper for all pipes up to 2 feet long, using stouter paper for the larger ones, or else have five thicknesses instead of four. All pipes above 2 feet long should be made of stout brown paper, of which an excellent sort for our purpose is sold for laying under carpets, it runs 4 feet 6 inches, and sometimes 5 feet wide, and is continuous, the price at small shops is 3s. per dozen yards, but at large, or wholesale shops, it may be purchased much cheaper. The 4-feet pipes should have five or six thicknesses, and the larger bourdons seven or eight thicknesses. It will be more convenient if you make the large bourdons in two lengths, and then join them in the centre, covering the joint with a band of linen or thin American cloth, to strengthen it. The bourdon CCC is 8 feet long and $5\frac{3}{4}$ inches diameter, the smallest is 2 feet long and $1\frac{7}{8}$ inch diameter. The stopt diapason CC is to be $3\frac{1}{4}$ inch diameter, and Tenor C $1\frac{3}{4}$ inch diameter. I apprehend that no difficulty will be experienced in setting out the scales for these.

Having completed the tubes we may now proceed with the cones for the feet, and may use up the paper in the tube mandrels for that purpose. No mandrel will be required for the cones for pipes less than 1 inch diameter, as you can roll the paper up without being particular as to the size, for they are sure to fit some pipe, and can be cut off at either end to the requisite size. Five inches is long enough for all pipes up to 18 inches long, but for pipes above that length they should gradually increase till they are about 9 inches long for a 4-foot pipe. The length of foot makes no difference in the tone, so it is a mere matter of convenience and appearance. For the cones of the larger pipes you had better make two or three mandrels about 15 inches long and of different diameters. Make them in the same way as the cones, only very much stouter. The cones should be stouter than the pipes as they have to bear all the weight, and are exposed to a good deal of wear. Having completed the cones you may next proceed to paint the inside of both them and the tubes, starting with the largest as you can trim your sponge mop smaller so as to suit the smaller pipes. While the paint is drying you can prepare the other parts. The stoppers for the stopt diapason and bourdon pipes may be made of wood shaped as in Fig. 10, covered with leather round the lower edge, so as to fit tightly inside the pipe. I prefer to make a different style of covering or stopper as follows:—Make a short length of tube the same as for the sliding piece for tuning the open pipes, glue a piece of stout card on the top of this, thus forming a box or lid. Glue a strip of soft leather round the inside, having previously pared down the edges of the leather ; this cap is to fit tightly on the outside of the pipe like a lid. The leather should be rubbed with a mixture of tallow and black lead to make it slip easily, for it should not fit too tightly to be moved, as the pipe is tuned by moving it up or down. This cap is much lighter than the wood stopper, easier to make, and there is no danger of it slipping down, as stoppers sometimes do, when there is a sudden change in temperature. The caps should fit loosely on the pipes at first so as to allow for three coats of paint on the pipe, when they should fit perfectly airtight. As it is best to put the stopt pipes together with caps on, they may be temporarily fitted by wrapping two or three thicknesses of paper round the pipe.

The caps of the stopt diapason should be 6 inches long for CC, and $\frac{1}{2}$ inch long for the smallest G. The tuning caps of the keraulophon are not closed at the top, they should be 6 inches long for Tenor C, and $1\frac{1}{2}$ inches long for the smallest G. In the centre of the

side of the cap, a distance of one diameter from the top, there is a round hole $\frac{3}{8}$ inch in diameter for Tenor C pipe, and about $\frac{1}{16}$ inch for top G. The best way to make this hole is by a taper bit of such size that when it is bored through the cap so that the point just touches the further side of it, the hole in Tenor C is $\frac{3}{8}$ inch in diameter, and as each cap gets smaller, the pushing the bit through so that it touches the further side, will cause the hole to diminish regularly. A sharp pointed stick will do instead of a bit, as the burr could be cleared off with a hot wire. The small scale, high mouth, and the hole in the sliding cap of the keraulophon cause it to give a rich, though quiet, stringy tone, which is very useful in solo passages.

The flute and flageolet pipes are made with the upper lip turned so that the chamfer comes on the inside of the pipe, and the languid is sloped downwards on the front edge, as shown in Fig. 13. This causes it to give a soft quiet tone. The flute should be softer in tone than the diapason, and the flageolet should be softer than the flute. The stopt diapason is made with a high mouth, and the upper lip is cut slightly circular, the lower lip may be a little below the top edge of the languid.

The sizes of the mouths for the several stops are as follows :

	Width of Mouth.	Height of Mouth.	Approximate Length of Longest Pipe.	Length of Shortest Pipe.
Bourdon...	One-fourth of the circumference	One-third of its width	8 ft.	2 ft.
Stopt Diapason..	One-fourth	One-third	4 ft.	$2\frac{1}{8}$ in.
Open Diapason ..	Two-ninths	One-fourth	4 ft.	$4\frac{1}{4}$ in.
Keraulophon ...	One-fifth	One-third	4 ft.	$4\frac{1}{4}$ in.
Flute	One-fifth	One fifth	4 ft.	$2\frac{1}{8}$ in.
Flageolet.........	One-fifth	One-sixth	2 ft.	$1\frac{1}{16}$ in.

The sizes of the holes at the bottom of the coned feet are about as given hereunder, but the pressure of wind and the voicing affect the sizes considerably, and they may have to be a little larger or a little smaller according to circumstances.

	CCC.	CC.	Tenor C.	Middle C.	Top G.
Bourdon....	$\frac{7}{8}$ inch	$\frac{5}{8}$ in.	$\frac{3}{8}$ in.	...	...
Stopt Diapason	...	$\frac{5}{8}$ in.	$\frac{3}{8}$ in.	$\frac{1}{4}$ in.	$\frac{1}{8}$ in.
Open Diapason	...	$\frac{1}{2}$ in.	$\frac{3}{8}$ in.	$\frac{1}{4}$ in.	$\frac{1}{8}$ in.
Flute	...	$\frac{3}{8}$ in.	$\frac{5}{16}$ in.	$\frac{3}{16}$ in.	$\frac{1}{8}$ in.
Keraulophon	...	$\frac{3}{8}$ in.	$\frac{5}{16}$ in.	$\frac{3}{16}$ in.	$\frac{1}{8}$ in.
Flageolet	...	$\frac{5}{16}$ in.	$\frac{1}{4}$ in.	$\frac{1}{8}$ in.	$\frac{1}{16}$ in.

The Lieblich Gedact is simply a stopt diapason of the same scale as the principal, but with a straight upper lip, and the lower lip slightly below the upper edge of the languid. The languid increases in thickness with the size of the pipe, that of a 4-foot pipe should be $\frac{1}{4}$ inch thick. The same remark applies to the lips, which should increase in size and thickness with the size of the pipe. The upper lip of the CC stopt diapason should be nearly $\frac{1}{8}$ inch thick at the thinnest edge. The lips can be expeditiously cut out of a piece of thin wood, by marking it out as shown in Fig. 16, and cutting through the marks with a tenon saw. The very best wood you can use for the languids and lips (except the smallest, which are simply veneer) is cigar-box wood. Cigar boxes can be purchased for twopence or threepence at most tobacconists or public-houses, and many shop-keepers will give them away to their customers. The languids of the larger pipes may be fitted into the ends of the tubes instead of being simply glued on to them.

Having prepared a quantity of languids, lips, etc., glue them on, having previously cut out the portion of the tube and cone where lips come.

About a dozen pipes is a good number to have in hand at one time for putting together.

The windway for the largest bourdon is nearly $\frac{1}{8}$ inch wide, for a CC stopt pipe $\frac{1}{16}$ inch wide, and gradually smaller for each succeeding pipe. Stopt pipes require a larger windway than open ones, as the mouths are cut higher and the upper lips are much thicker. The voicing nicks are nearly $\frac{1}{8}$ inch apart in a 4-foot pipe, but get closer and smaller as the pipe diminishes in size, until in the smallest pipes they are scarcely perceptible scratches very close together. They may be made with a very fine tuning file, or a small penknife. For a loud tone, the nicks should be few and deep, for a soft, sweet tone, they must be very fine and close together, the burrs being taken off by a slight touch with a piece of fine glass-paper. The upper chamfer should not be nicked. Wherever the wind passes there should be no sharp edges or it will cause a hissing noise, therefore, the top and bottom edges of the languid, the edges of the lower lip, and the front edge of the upper lip should be slightly rounded off, but the inner edge of the top lip should be left square.

If it should happen that when a pipe is finished the windway is too narrow, it may generally be set right by passing the thin blade of a penknife flat down between the lip and the edge of the languid, but if this is not sufficient, cut a slip of fine glass-paper and insert that, moving it gently up and down, so as to take a very little off either the edge of the languid or the inner edge of the lip, whichever may be required, and then carefully touch up the voicing. For cutting the lips a little higher, and touching up the pipes generally, you will find the following tool very handy, and should make five or six of different sizes:—a thin slip of wood, or veneer, say 1 inch wide at one end, and $\frac{1}{2}$ inch wide at the other, covered on one side with very fine glass-paper and on the other with some a little coarser. You will thus have four files in one. Another handy little appliance is shown at Fig. 18, it is a block of wood, 5 or 6 inches long, 3 inches wide, and $1\frac{1}{2}$ inches thick, covered on the bottom with a flat piece of cork. A piece of glass-paper can be stretched over this, and

grasped in the hand, and may then be used to smooth off the ends of the pipes, the edges of the lips, and any small chamfering. You will have this block in requisition at all stages of the work.

The pipes, caps, and tuning pieces, should have three coats of oil colour, a little varnish being mixed with the last coat. It is a good plan to paint each stop a different colour, as they can then be picked out at once.

Write the name of the note, and the stop, on the back of each pipe, using ordinary ink and a Waverley or Pickwick pen, as the points will not scratch the paint. Breathe on the place and pass the finger over it, the ink will then flow as nicely as on writing paper.

The painting or varnishing of the pipes preserves them from the damp, and improves both their tone and appearance.

The following points should be strictly adhered to, viz., all pipes above 12 inches long should be allowed to dry on the mandrel, or they are apt to cast a little, which will not improve their appearance ; the foot to be perfectly straight with the pipe, the lips to be quite parallel with the edge of the languid and with each other, the nicks for the voicing to be even and regular, and the caps of the stopped pipes to fit perfectly air-tight.

In my next chapter I shall deal with the usual mode of making wood pipes.

(*To be continued.*) page 81

WALKING-STICKS: HOW TO MAKE THEM.

By GEORGE EDWINSON.

AT most periods of our lives we display a fondness for sticks. Even in the palmy days when vigorous manhood does not require a staff to support his tottering footsteps, he invents some other excuse as a reason for carrying a stick in his hand, and feels still more lonely in his lonely walk if he happens to have left the mute companion of his travels at home. A variety of tastes are displayed in the selection of walking-sticks—tastes not always governed by the necessities of the selector, nor by the fashion of the day, but sometimes by some peculiar idiosyncrasy of the individual. Hence, whilst some prefer a lithe holly stick, or hazel, others prefer ash or elm, others are content with nothing less than a stout oaken cudgel, and a son of Erin would revel in a tough little bit of blackthorn in preference to all other woods. Some again scorn our homely woods and will carry nothing commoner than a foreign cane or bamboo fitted with a head of gold or silver; others prefer those with grotesquely-carved heads, and not a few take a pride in carrying a stick cut or pulled by their own hands from hedge, copse, or wood. But a stick thus pulled or cut is apt to betray the ignorance of its owner by its rough head, its cracked and scored shaft, its crookedness, its rough bark, or its unpolished condition. To meet the wants of those who would like to prepare such sticks for themselves, the following hints are given, and may not be unacceptable.

Walking-sticks should not be cut or pulled in the spring later than the month of February nor earlier in the autumn than the month of October ; the best time of the year being from the first week in December to the last week in February. Sticks should be laid aside in only a moderately dry cool place, and should not be worked nor the bark taken off until they are half dry, then they are most supple and may be bent or straightened without injury. In laying by sticks to dry, the knots should not be trimmed close—in fact, it is best to only rough trim the stick, leaving the spurs of branches and of roots on the stick fully an inch long. The following kinds of woods are pulled and cut for walking-sticks in addition to others not enumerated here.

Holly.—Sticks of this wood are found growing out from the side of older stems, and shooting up in nearly a straight line through the dense foliage above. Occasionally they may be cut with a crutch piece across the growing end, or with a crook or knob. These are the most valuable. Luck may sometimes hap on a well-grown sapling in the deep woods, this should be pulled or dug up for the sake of its roots. Saplings and hedge sticks may often be found, from 3 to 4 feet long, with the top part to the length of a foot, from $\frac{3}{8}$ to $\frac{1}{4}$ inch in diameter; these are not suitable for walking-sticks, but they make excellent whip handles, and are used for this purpose by country waggoners. Holly sticks should only be rough trimmed when green and put away in this state to season. They make tough, supple, and moderately heavy walking-sticks, and their closely grained wood admits of the carver's skill being exercised on the knob, formed by the root and its rootlets.

Ash.—Respectable sticks of this wood may sometimes be cut out of a hedge, or pulled from the side of an old stump or pollard, but the quality of such sticks will not compare with that of sapling ash, pulled or dug up in some copse or wood. Sapling, or "ground" ash, as it is called, vies with holly for toughness and suppleness, whilst sticks of equal size yield the palm to ash in point of stability, but to holly for durability. Hedge sticks of ash get brittle as they get dry and old, and the same remark applies to most sticks pulled from old stumps. Ash sticks must also be rough trimmed and well seasoned before they are barked

and polished. The wood and curiously-formed root-knobs of ground ash will admit of excellent grotesque carving.

Oak.—This of all sticks is the most reliable, and stout oaken cudgels are esteemed by most persons as some of the best props to failing legs, as well as the best weapons for self-defence against quarrelsome dogs and rowdy ruffians. Straight sticks of sapling oak are not always easily obtained, but copse-wood sticks pulled from the stumps of trees form excellent substitutes. These should be selected for walking-sticks which taper gradually from $\frac{3}{4}$ of an inch just below the knob or crutch, down to $\frac{1}{2}$ inch at the opposite end. Gnarled and crooked oak sticks are sometimes fancied, and heavy cudgels are sometimes selected for defensive purposes. Oak sticks split in drying when the bark has been stripped off, or the knots cut too close, or the sticks put away to dry in a very warm dry place; they are then rendered useless for walking-sticks and cudgels. The wood and also the form of the knobs or roots will admit of much taste being displayed in grotesque carving.

Elm.—From the roots of elm trees, saplings with a coating of rough bark will shoot up straight to a height of some ten or twelve feet. These will furnish some good walking-sticks of the fancy type, the rough bark serving the purpose of ornamentation when the sticks are dried, stained, varnished, and polished. The wood is also durable, but not very supple when dried, and sticks of it are not suitable to hard usage. The usual precautions must be taken in drying them.

Hazel.—Light sticks of this wood may be cut or pulled from almost every hedgerow and in any wood. Saplings are not unfrequently found of most symmetrical proportions, tapering from 1 inch down to $\frac{1}{4}$ inch through a length of some ten or twelve feet, these are used by country swains as goads for the oxen, and form very tough sticks. The wood is very light, but it has the disadvantage of bending and remaining crooked when leant upon heavily. It is also soft, and may be easily carved. Occasionally, hazel sticks may be found grotesquely entwined with honeysuckle, and its stem so deeply furrowed with the supple vine as to enclose the convolutions of the climber.

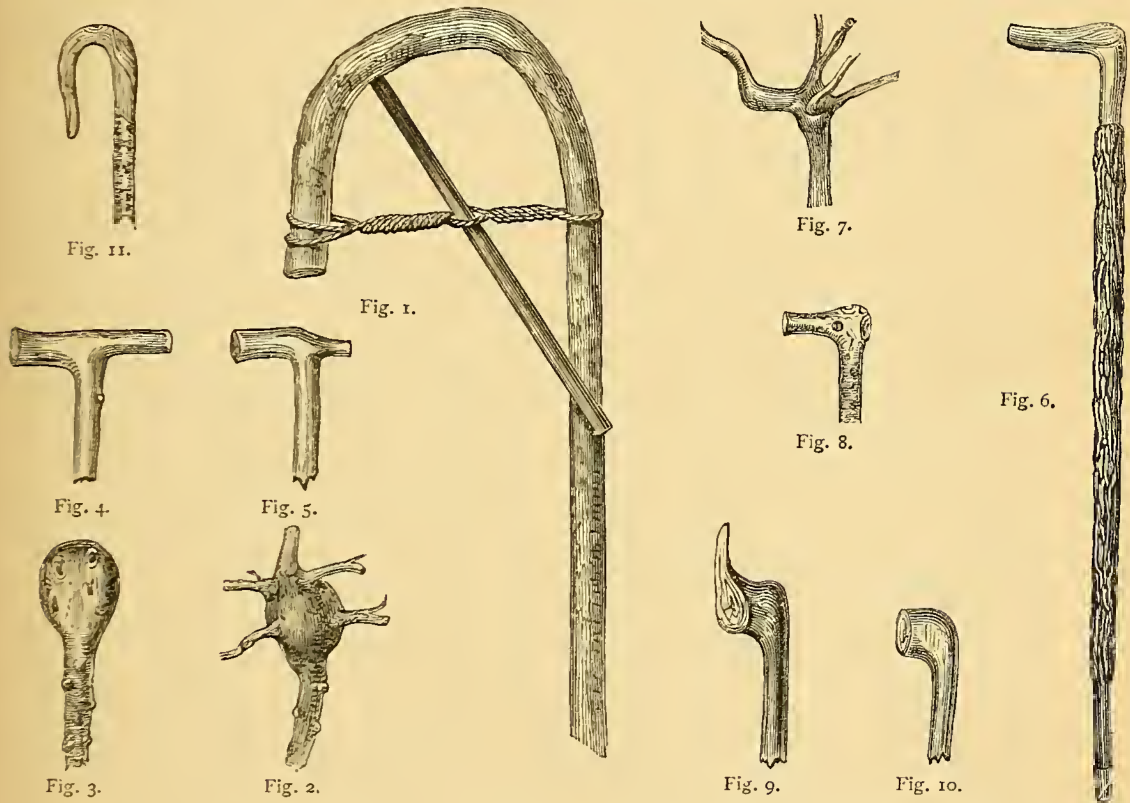


FIG. 1.—CROOK STICK, SHOWING METHOD OF TURNING CROOK BY MEANS OF TOURNIQUET. FIG. 2.—BLACKTHORN KNOB, ROUGH. FIG. 3.—BLACKTHORN KNOB, TRIMMED. FIG. 4.—CRUTCH FORM OF CROOK. FIG. 5.—HALF CRUTCH. FIG. 6.—ELM STICK. FIG. 7.—ASH ROOT, AS DUG UP. FIG. 8.—ASH ROOT, TRIMMED. FIG. 9.—ASH OR OAK KNOB, AS PULLED FROM POLLARD OR STUMP. FIG. 10.—THE SAME, TRIMMED. FIG. 11.—STICK BENT AND TRIMMED TO FORM CROOK.

Sticks of this kind are valued as fancy sticks, and look well when properly prepared, varnished and polished.

Blackthorn.—This is the wood of the bush which bears the sloe, and the bullace or wild plum. In exposed positions it is only a dwarf shrub, but in sheltered hedgerows and woodlands it attains a height of some twenty feet, and its saplings run up to a length of from six to eight feet straight and taper, but covered with stout spines and small twigs. Those saplings make excellent walking-sticks, both when they can be dug or pulled up, and also when they have to be cut off. The spines and twigs must not be cut off close until the stick is half dried, and then cut with a sharp knife ; in fact, the knots left from the spines and twigs when left as slight round excrescences enhance the beauty of the finished stick. Blackthorn is more famous for its hardness, strength, stability, and durability, than for lightness, elasticity, and suppleness. A cudgel made of blackthorn will deal heavy blows, but when matched against one of oak would splinter at the knots, the oak being the tougher stick. The wood is hard and not easily carved, but the root knobs will admit of a very fine and smooth polish, most grateful to the palm of the hand of the tired pedestrain. Its congener, the whitethorn, or hawthorn, is not so suitable for walking-sticks, being more brittle and less durable, but it is sometimes used for this purpose.

Among fruit trees, the cherry will furnish some very nice fancy sticks, supple, and of tolerable strength ; and apple wood, when well and carefully dried, will yield some good sticks. Grape-vine and briar sticks are sometimes used, but they cannot be relied upon for stability when leant upon.

When sticks are half-dried, that is, when the bark is shrunken, has lost its sappy greenness and refuses to peel freelv, they may be trimmed, straightened, or bent as required. To straighten or to bend them, they may be held over steam until rendered supple, or buried in hot wet sand until this end has been attained, they must then be given the form they are intended to assume (whilst still hot), and kept in this form until they are cold, straight sticks being tied firmly in small bundles, and wound with a coil of rope from end to end, or suspended from a beam by the knob end, whilst a heavy weight is hung from the small end. Crooks may be turned by immersing the end in boiling water for five or ten minutes, then bending it to the desired form, and securing it in this position with a tourniquet (Fig. 1) until the stick is cold. The bark may next be taken off with a sharp knife, if so required, and care must be taken not to splinter or chip the wood of the stick. Knots may be trimmed at the same time, and the knob trimmed up to shape. Hard and fast rules cannot be given for the formation of knobs, since their form must be regulated by the natural knobs, and these are often very suggestive in themselves. One or two things should, however, receive consideration in designing a knob, and the first should be the ultimate use of the stick. If the stick is to be a fancy one, to be carried and swung in the hand, more for appearance than for use : then any amount of skill in carvings may be expended on the knob ; but if the stick is for use, we should first consider its use. Round smooth-headed knobs (Fig. 3) carved and polished to fit comfortably into the palm of the hand, will meet with most acceptance from those who use a stick as a support. But knobs thus formed, and shorn of a projecting crook or hook, often slip from beneath the arm or out of the hand when its owner wishes to use both hands for some purpose—for instance, to light a cigar or a pipe. The head of a dog with a long muzzle, the head of a swan or a goose, forms an appropriate design for such a stick. The crutch (Fig. 4) or half-crutch form (Fig. 5) is also a comfortable one, but the ordinary crook (Fig. 1) although useful for many other purposes, does not fit comfortably in the hand, it is too much of a handful, and the central support usually finds its bearing under the forefinger instead of the palm of the hand. Sharp carving on the knob should always be discouraged, for it only hurts the hand, but the neck of the knob may receive the carver's attention. We shall avoid reference to fancy sticks with metal heads of gold, or silver, or silver plated brass, and to those clever contrivances, which store a *multum in parvo* of tools in the head of the stick ; also leaving out of our consideration, the loaded stick with its half-leaden head, and that barbarous relic of the dark ages, known as the sword-stick—these we will leave in professional hands.

Elm sticks with the rough bark left on (Fig. 6) must be neatly trimmed naked around the neck of the knob, and at the bottom of the stick just above the ferrule, loose bark should also be neatly trimmed with a sharp knife, and the whole lightly gone over with medium glass-paper. The stick should then receive a dressing of boiled linseed oil, and be left to dry. When dry, it will be well to go over the smooth parts with a little polish, and finally give one or two coats of hard spirit, or of copal varnish. Holly, ash, hazel, cherry, apple, birch, etc., should have part of their bark only taken off with a sharp knife, leaving all knots smoothly trimmed, rounded, and clean. The sticks should be then lightly glass-papered, and when smooth, dressed with boiled linseed oil, dried, polished, and varnished. Oak sticks look best when carefully barked in hot water, cleared of the loose bark by rubbing with canvas, dried, dressed with boiled linseed oil, again dried, then polished and

varnished with oak varnish. Blackthorn sticks should be only partly barked, the knots smoothly trimmed, then glass-papered quite smooth, dressed and varnished as directed for other sticks. Sticks may be stained black after they have been glass-papered, and before they are dressed with oil, by first brushing them over with a hot and strong decoction of logwood and nut-galls, and when this has well-dried, brushing over them some vinegar or acetic acid in which a quantity of proto-sulphate of iron, some iron rust, or some old rusty nails has been steeped some two or three days previously. A brown or mahogany tint may be given by adding some dragon's blood to the polish, and a yellow tint may be obtained by adding yellow ochre. Some persons use ink for a black stain, and others put drop black in the varnish, but the black stain above mentioned is preferable to all others. The sticks are to be polished and varnished after the stain is dry. The bottom ends of walking-sticks should be guarded from excessive wear by a neat brass ferrule, but these are more cheaply bought than made. They should be secured to the stick by two small screws, one on each side of the stick, to prevent them from coming off when they get loose in dry weather.

WOOD-WORKING MACHINERY FOR AMATEURS.

By A. W. J. TAYLER, C.E.

V.—HAND-POWER MORTISING AND BORING MACHINES.

MORTISING machines may be divided simply into two classes—those in which the chisel or cutter is worked with a reciprocating motion, and those in which it is worked by a rotary motion. Many modifications of these two motions are however adopted, in order to suit the different classes of work or material that it is desired to operate upon. The invention of the mortising machine is attributed generally to Sir Samuel Bentham, in the year 1793. Rees, in his "Cyclopædia" (1819), mentions several machines that were made by Brunel, in connection with Henry Maudslay, in 1807, for the Government, and which were in successful operation at Portsmouth Dockyard, and elsewhere, for many years.

Hand and foot-power mortising machines are always of the reciprocating class. Those worked by hand-power are extremely useful tools, and much superior to those worked by the foot.

To an amateur a small mortising machine would present the advantage of enabling him, without acquiring any special skill, to make a mortise far more expeditiously, and far truer, than would be possible for the most expert workman to perform by hand, while at the same time effecting a saving of a vast amount of physical exertion over that necessary to perform the same work with a mallet and chisel.

We illustrate in Fig. 21 a hand-power mortising and boring machine combined, a tenoning arrangement could also be easily added if desired. Compared with hand-labour the work this machine would perform would be in the ratio of about six to one.

The action of the machine is extremely simple, and easily understood. The counterbalanced forked lever shown in the engraving, which can be worked either by one or both hands, gives motion to the chisel. It is connected with a gun-metal cross-head at the top of the vertical spindle by two wrought-iron double eye-pieces. The wood to be operated upon is placed on a table immediately beneath the chisel. By turning the large hand-wheel shown in front of the machine, this table can be shifted. This plan is the most convenient for light work, but for heavy work a self-acting arrangement can be used with advantage. This self-acting motion is gained by a side rod from the forked lever, acting by means of a stop-piece on another small weighted lever, at the end of which is a wrought-iron paul, acting on a toothed wheel, which is fixed to a spindle. A pinion on this spindle works in a rack beneath the table. Thus when the forked lever is in work, a lateral motion is given to the same. It can easily be thrown out of gear, when not wanted, by moving the stop-piece. The chisel used is of solid cast steel tapered somewhat on back and sides, with a plain tapered end fitting into a socket, which will be found preferable to an end fitted with a feather, as the feather is apt after a time to get loose and twisted. The boring apparatus consists of a pair of bevel wheels worked by a handle which gives rotary motion to the spindle, an auger being inserted in the spindle socket in place of the chisel. The tenoning arrangement consists of a pair of adjustable bevelled knives, fixed to a forked tool-holder, fitted into the chisel socket, and working in a slide fixed to the table.

This machine is capable of mortising either hard or soft wood, and boring wood or iron and other metals. It can be obtained complete, as shown in the engraving, for mortising and boring, but without the tenoning arrangement, with 8 cast-steel chisels, 1 core-driver, 1 drill, 1 auger, spanners, and tool box for £18, or arranged for mortising only, £16. A lighter machine, of similar pattern, is also made for £12 12s.

Fig. 22 represents a hand-power mortising and boring machine of lighter pattern than that just described. The design is simple, the vertical frame and the base are all in one piece, thereby giving the machine greater strength and increased firmness in

working. The bracket carrying the chisel works in V slides, and the action is direct, and always over the work, and not so liable to wear loose by the jarring produced by the chisel. The chisel can be removed or replaced instantly, thus effecting a considerable saving of time. The arrangement for reversing the chisel is also exceedingly simple and accurate, and not dependent upon a spring. For light work this is decidedly a very effective little machine, it is capable of cutting a mortise 6 inches in depth, and the table will take in timber of any length, by 8 inches wide. The price, complete, as shown in the sketch, including 8 chisels from ¼ inch to 1 inch, 1 core-driver, 1 chisel remover, 1 screw key, 3 drills for iron, and 3 augers for wood, is £13 13s., or arranged for mortising, only £12.

In fixing the chisel to commence work with the two machines just described, press it up in its socket, making a slight indentation in the wood, then reverse the chisel, and again bring it down, and note carefully whether it falls square between the gauge lines or not. In wedging a mortise, it is only necessary to raise one end of the wood and make the wedge cut before removing same. In order to prevent the jar as much as possible, which takes place at the cross-head at the top of the vertical spindle, and which is considerable in mortising hard woods, an india-rubber washer, about an inch in thickness, should be fitted on the spindle immediately beneath the cross-head. The operation of the tenoning arrangement is the same as for mortising, only that instead of being cut away in the middle the wood is cut at the edges, and the tenon left in the centre. This is a very efficient and rapid way of cutting tenons, but the knives require to be kept in first-rate condition, otherwise they will be found to spring, thus cutting an untrue tenon, that is to say, thicker at the bottom than the top. The table which carries the wood can be made to cant so that it can be fixed at any angle that may be required. When holes have to be bored, or mortises and tenons cut at an angle, this is performed by means of a quadrant and pointer, worked by a worm and worm wheel, it can likewise be so arranged as to rise and fall when the work varies very much.

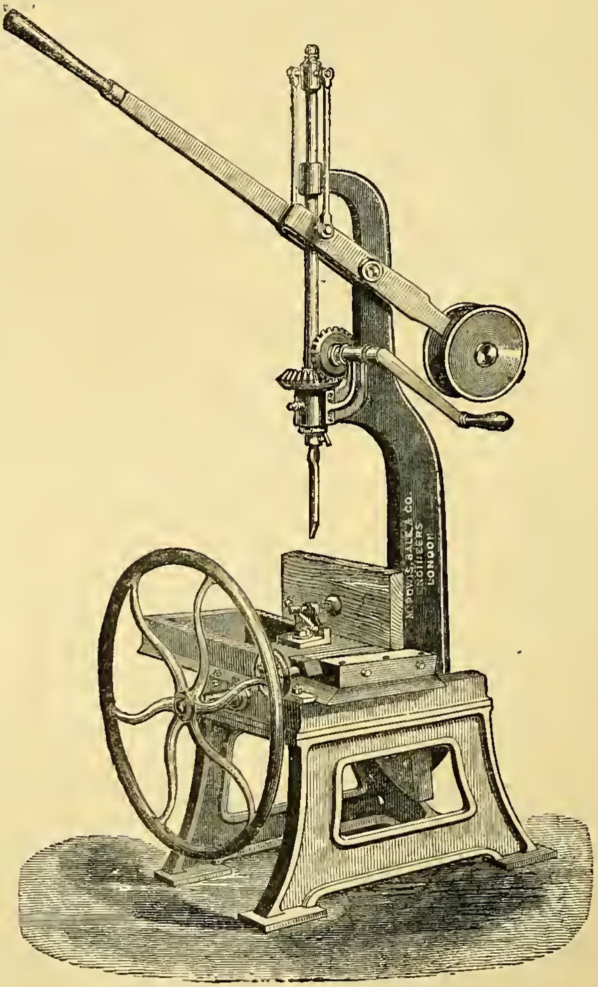


FIG. 21.—HAND-POWER MORTISING AND BORING MACHINE.

Fig. 23 is a small boring machine which, on account of its simplicity of construction, efficient working, and low cost, ought to recommend itself to amateurs, the weight of the whole apparatus is only 20lbs. The depth of the hole to be bored can be accurately gauged by means of a set screw upon the standard. When the hole has been bored to the desired depth, the rack can easily be swung, by a very simple arrangement, into the bevelled gear, and by continuing to turn the handles in the same direction as in boring, the auger is withdrawn, it is thus practically self-withdrawing. By a simple reverse motion of the handles the rack can be thrown out of gear, and the machine rendered ready to bore a new hole. Another great advantage is the ease with which it can be adjusted to any desired angle. The price of the angular machine, Fig. 24, with withdrawing rack, stop, and graduated column is £2 16s. Arranged for boring at right angles only, £2 5s.

Fig. 25 is a machine on exactly the same principle as Fig. 23, only that the standard is made of wood instead of iron. The price of this machine, arranged for angular boring, is £1 14s., or for boring at right angles only, £1 9s.

The mode of using the above is so self-evident as hardly to demand any explanation. The machine should be simply placed upon the timber to be bored,

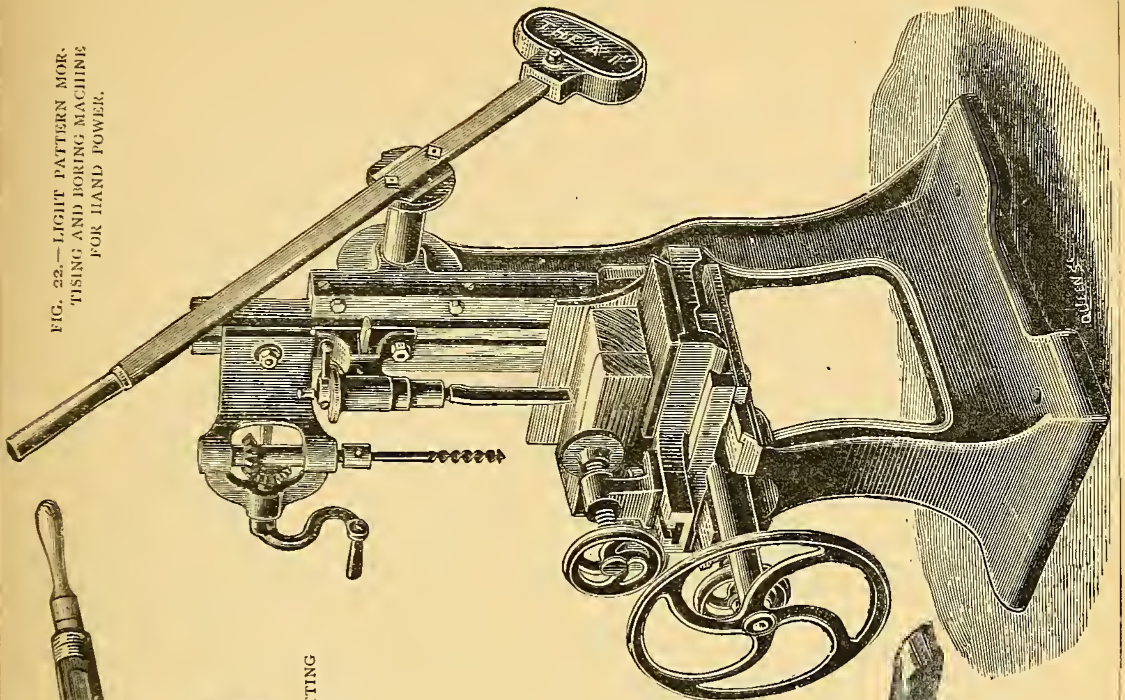


FIG. 22.—LIGHT PATTERN MORTISING AND BORING MACHINE FOR HAND POWER.

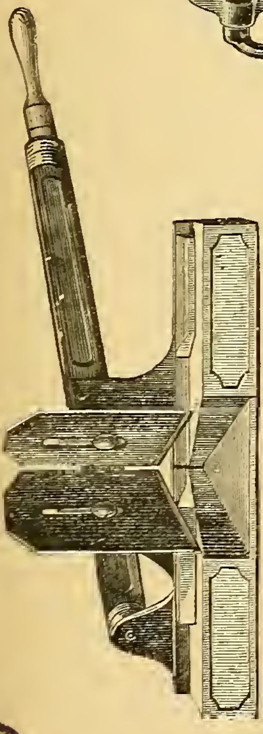


FIG. 26.—MITRE-CUTTING MACHINE.

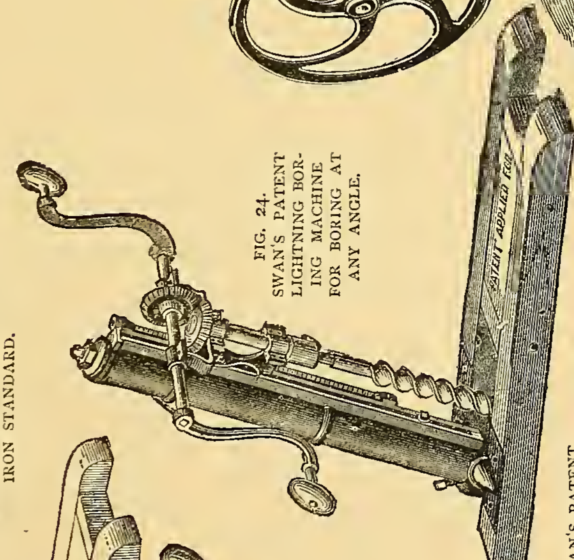


FIG. 24. SWAN'S PATENT LIGHTNING BORING MACHINE FOR BORING AT ANY ANGLE.

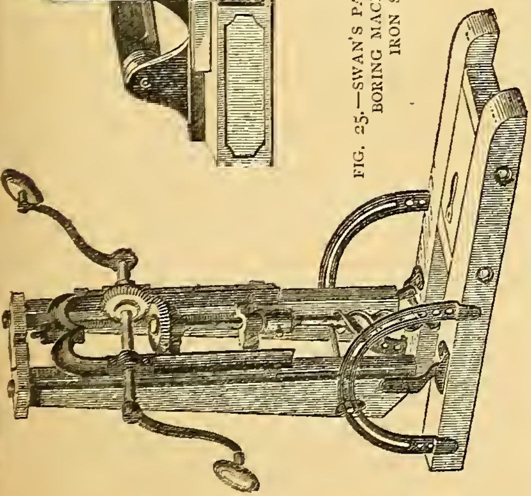


FIG. 25.—SWAN'S PATENT LIGHTNING BORING MACHINE, IRON STANDARD.

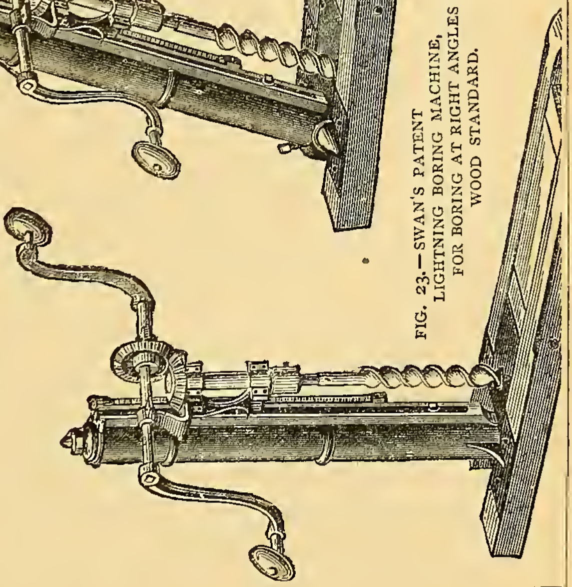


FIG. 23.—SWAN'S PATENT LIGHTNING BORING MACHINE, FOR BORING AT RIGHT ANGLES ONLY. WOOD STANDARD.

so that the auger is exactly over the spot where it is desired to make the hole, then the column should be carefully adjusted to the required angle by means of a set screw in those with an iron column, and of two half-quadrants and thumb-screws in those with a wooden one. The operator then places himself astride upon the wooden base, and gives motion to the handles. His weight is sufficient to prevent the machine from shifting, and the weight of the slide and spindle causes the auger to feed automatically.

Fig. 26 represents a machine for cutting mitres, such as jointing picture frames, inlay frame mouldings, etc. As compared with a saw, half the time is saved, and besides sawn mitres are far inferior in quality and accuracy of fit. A true mitre can be cut at one stroke, thus no planing or other fitting is necessary, however particular the work may be. Gilt, veneered, hard-wood and other mouldings can be cut far cleaner than in any other way, as well as the rebates in bolection mouldings which are left without breakage. To use the machine the wood is simply held by the left hand, whilst the cut is made with the right. The price of this machine, to mitre 3 inches by 2½ inches, is £3 10s. Booth's Mitre-cutting Machine, noticed in "Notes on Novelties" in this Part, is a cheaper machine than this, and will, therefore, be regarded with more favour by most amateur wood-workers.

The two mortising and boring machines can be obtained from Messrs. M. Powis, Bale, & Co., 20, *Budge Row*, *E.C.* Swan's patent boring machine from the Russell & Erwin Manufacturing Company, 47, *Upper Thames Street*, *E.C.* The mitre cutting machine from Mr. B. Haigh, Engineer, *Oldham*.

AN AMATEUR'S PHOTOGRAPHIC STUDIO, AND ITS CONSTRUCTION.

By JAMES PARKINSON.

(*For Illustrations, see Supplement to this Part.*)

I.—POSITION AND CONSTRUCTION OF THE BUILDING.

THE following is a description of a novel, and as I have never seen or heard of one so constructed, I claim original, photographic studio; and at the outset I would give the invaluable motto, which should be worked out in all photographic operations, viz., "Nothing can be done too thoroughly." On referring to the plans in the Supplement, it will be seen that the writer's aim is not as many recommend, to knock up any kind of a shed, and think it will do, but to give carefully-prepared plans and specifications for a studio that will be an ornament to the garden and a credit to its builder, as well as useful. It is not essentially necessary that the directions given should be strictly adhered to, as no doubt each amateur will have ideas of his own in accordance with his ability, therefore alternative methods are sometimes appended by which construction is rendered more simple; but bear in mind, the only difference will be in manual labour and not in expense, and as the amateur is to be his own carpenter, that is a matter of no importance, and the preparation of the necessary parts will afford a very profitable way of spending the long winter evenings.

I should most certainly advise the amateur to strictly adhere to the principle as shown in the plans in the Supplement, as if the timbers are simply nailed on in the ordinary way, I am afraid after the storms and rains of winter, followed by the hot sun of summer, it would be far from light-tight, which is the one thing necessary to produce satisfactory results.

The direct rays of the sun must be avoided. If the skylight is facing the east, the sun shines on the structure all the forenoon; if west, it receives the afternoon rays; while one of southerly aspect receives both the morning and afternoon rays; the north light is the only aspect free from this objection;—hence this is the reason that all skylights (where obtainable) are constructed so as to receive the north light.

It will be noticed that the side light slopes inwards, which is the part claimed as original, as it will be found of great advantage, compared with the ordinary perpendicular side light, as the lights are more evenly balanced.

If you have a blank wall in your garden (facing the north), by building the studio against this, it will save a considerable portion of the expense and labour. After selecting your site for the studio, the first thing to be done is to turn excavator.

Dig out the ground to the length and depth required for the brick foundation, fill in to the brickwork as you proceed, and well ram the same. Excavate for, and lay, where shown by strong dotted lines on ground plan, good glazed earthenware socketed drain-pipes 4½ inches diameter, lay to a proper fall, well bed and joint with good clay puddle, fill the ground up, and well ram. Of course, each person must carry the pipes to the nearest existing drain. Build where shown on plan, two brickbreadth eyes (or grids) in cement with a flag bottom, and cover over with 18 by 18 by 6 inch stone cover, with a 9 by 9 inch cast iron stench trap grid.

The bricks should be the best common, and should be hard, square, and well burned, and should be carefully selected for uniformity of colour and regularity of shape; and the brickwork should be well flushed through with mortar. If you do not buy your mortar, it should be composed of the best Buxton or Welsh lime

and good clean sharp sand, in the proportion of one-third lime to two-thirds sand, by measure, and must be thoroughly well mixed together.

The brick foundation must have two courses of footings and about two courses above the ground level —in all, about six courses high and 9 inches thick.

We may now begin with the joiner's work, and this you may either make a very long or short part of the job, as it all depends upon the work you put in. I myself am fond of cutting and carving, and when I begin never know when I shall have finished. My object is to produce everything in the photographic art, that if it should come under the professional photographer's eye, it will be fit to obtain his commendation. The best timber to use will be the best Baltic red deal, and should be carefully selected, to be free from sap, shakes, large loose or dead knots, and in all cases must be well seasoned. On referring to the drawings it will be readily seen what is the intention of the designer; and as the plans are all worked out to $\frac{1}{4}$ inch scale, and every timber figured, it will be of very little use going to any great extent of describing them here.

The perspective is $\frac{1}{3}$ of an inch to a foot and the interior $\frac{1}{2}$ inch to a foot.

The first piece to get ready is the plate or sill that is laid on the brickwork, in a good bed of well made mortar; this plate must be 6 by 3 inches, well mortised and wedged together at angles, and will require mortising in order to secure the uprights, which must be the following dimensions: The corner ones $4\frac{1}{2}$ by 3 inches, the intermediate uprights to be $3\frac{1}{2}$ by 3 inches, and the cross-rails 3 by 3 inches, the top rail or wall plate, on which the spars are fastened, must be $4\frac{1}{2}$ by 3 inches, the sill proper must be 6 by 3 inches on the front of the studio, but round the remainder of the building it must be $4\frac{1}{2}$ by 3 inches.

Of course, if you intend constructing the woodwork as shown on the plans, it will be necessary to do the stop chamfering before you fix your uprights and cross rails. When you have got all your framework cut, planed, and mortised, fix them all temporarily together, and see that they fit properly, then wedge up with good wedges dipped in glue; be sure to take great care that you get your structure perfectly perpendicular and square. Next comes the roof timbers.

Ridge piece,	lettered on plan	A, 6 by $1\frac{1}{4}$	inches
Hip pieces	„	B, 8 by $1\frac{1}{4}$	„
„ boardings	„	C, 7 by 1	„
Spars	„	D, 3 by $2\frac{1}{2}$	„
„	„	E, $2\frac{1}{2}$ by 2	„
Stays to spars	„	F, 3 by $1\frac{1}{4}$	„

The ridge and hip pieces are to fasten the spars to, the hip boarding is fastened to the spars where shown on roof. The cross bars are to be fastened to the spars as shown, to prevent the outward thrust; the bottom end of the spars will want sawing, as shown in the small sketch on plan; the whole of the roof timbers to be put together loosely, and properly levelled before it is securely fixed in its place. Next comes the doorway and door, this is composed of two uprights and a lintel casing, $4\frac{1}{2}$ by $1\frac{1}{4}$ inch, to be properly framed together; the roof of the doorway to have spars $2\frac{1}{2}$ by $2\frac{1}{2}$ inches, and two end pieces, as shown in perspective view, $4\frac{1}{2}$ by 2 inches, the spars to be notched same as in large roof. The door-frame must be rebated on the inside so as to admit the door to fit in, and the outside must be chamfered. The door must be a 2-inch framed four-panelled door, the bottom panels fitted in with diagonal battens, the upper panels rebated so as to receive glass (or you might here introduce a couple of transparencies from your own negatives); hang the door with one pair of 4-inch butts or hinges, and fasten with strong ornamental thumb latch and a 10-inch wood stock lock. The inside door from studio to dark-room should be a $1\frac{3}{4}$ inch framed four-panelled, and moulded one side, hung to the two uprights, as shown, with one pair of 3-inch butts, and fastened with a 6-inch iron rim lock, with brass furniture.

On looking at the view of interior you will see three spars 3 by $2\frac{1}{2}$ inches, fastened from uprights to spars and stopped by blocks at each end; the object of these are to help to support the roof. At each end where the skylight does not come, the spars are kept together by the stays, but as it is desirable to cause as few shadows as possible, hence this contrivance.

Then next comes the filling up of the frame of the building. This must be done in accordance with the plans and the description of the work that will be given presently. Certainly it will take up much time, but the work will be much more satisfactory in every way. It is necessary that the filling up should be done in many pieces, if not, it is bound to warp and become useless. If you do not care to go to the trouble of stop-chamfering, the best thing is to obtain some tongued and grooved V-jointed boarding 6 inches wide, but be sure you have it immediately after it has been stoved. Any builder will stove you what you want. It should be stoved for about nine days immediately before being used. The method of fixing is a very easy plan: on the inside of each upright nail two small ribs, which must be mitred at the corners, and must be $\frac{1}{2}$ by $\frac{3}{4}$ inch, and placed 1 inch apart, so as to admit of the panelling, as in sketch on plan. Of course, put the outside rib on first, which must be $\frac{1}{2}$ inch from front face of each upright, or crosspiece, then from the inside put in your panels, and be sure they are fitted as tightly as possible, then nail on the inside rib.

The small window in the dark room is in two parts, each 1 foot square, and one on each side of the

upright should be of $1\frac{1}{2}$ inch moulded stuff, rebated and beaded, each being fastened with two small hinges, so as to open for ventilation ; to be glazed with best quality of ruby glass.

The floor must be composed of $4\frac{1}{2}$ by 3 inch joist, laid crossways, as shown in section, on which should be laid 1 inch tongued and grooved 6-inch wide boards, these boards should be cramped together (you can *borrow* a cramp where you buy your timber), well nailed down, punched, puttied, and dressed off. Now comes the window and skylight; and as the window frame has a considerable weight to carry, it will be necessary to make it look rather formidable. For the window, the frame must be composed of upright bars, as sketch on plan, $2\frac{1}{2}$ by $1\frac{3}{4}$ inch cross-bars, 2 by $1\frac{1}{2}$ inch ; the uprights must be let into the sill at bottom, and wallplate at top. For the skylight, frame 2 by $1\frac{3}{4}$ inches, which must be treated same as the spars, and made to project about 3 inches. It will be necessary to form a wooden ridge from the centre portion, so as to diminish weight ; the cross-bars in skylight must be $1\frac{1}{2}$ by $1\frac{3}{4}$ inches, and must not come up to the face of the frame, as the top square must overlap the bottom one about 2 inches. The whole of the windows should be glazed with 24 ounce sheet-glass (perfectly white), should be selected, free from specks, waves, or other imperfections, and should be well-bedded in good hand-made putty, and thoroughly cleaned when complete.

As very few of my readers will be able to do their own slating, I shall not go into the matter very deeply. A very good slate, and one that would do here well, is a 24 by 12 inch, second quality, of Duchess Welsh slates, which should be laid on $2\frac{1}{2}$ by $\frac{3}{4}$ inch Baltic battens, each slate should have 3 inches lap, and should be nailed with two 2 inch galvanized iron nails, and should be well tiered underneath with good lime and hair mortar. The eaves, or bottom course, should be double ; the hips must be close cut, and to improve the appearance of the roof inside, after the slating is finished, and you have waited to see if it is perfectly drop dry, give the under side, between the spars, two good coats of plaster ; it will then have a much more finished appearance. It is intended to cover the ridges with blue Staffordshire ridged tiles, except the centre portion, that is where the skylight butts against the ridge, which, as before mentioned, must be wood.

The gutters must be about $3\frac{3}{4}$ by $2\frac{1}{2}$ inches, and the down-spouts $2\frac{3}{4}$ inches; of course, you must see that you get the necessary stopped and returned ends to gutters, and properly secure them to spars with wrought-iron hanging irons, and the down-spouts must have proper shoes at bottom.

The hips will want lining with lead, about 18 inches wide, and where the dark room roof butts against the studio, it must be step-flashed with lead, average 10 inches wide, which must be driven in between joints in timber, and pointed in mastic cement.

The whole of the wood and ironwork must have three good coats of paint ; the first coat on the iron-work should be red lead and boiled linseed oil, and all woodwork should be thoroughly pumiced before the last coat is applied—the colour, of course, will depend upon the choice of the builder ; but the inside should be painted in any of the neutral tints; of course, if the outside was stained and varnished with copal varnish, it would add much to the beauty of the studio when finished. You will require two stone steps at the studio door; these you had better buy ready made.

The interior arrangement of blinds, reflectors, dark room, etc., will be treated on in a future article.

(*To be continued.*)

BOOKBINDING FOR AMATEURS.

By the Author of "The Art of Bookbinding."

IV.—FORWARDING.

IN my last paper, I made mention of keys used in sewing, and thinking that my readers may be puzzled as to what they are, I now give a full-size sketch of one in Fig. 22. In a note in the same paper I have also spoken about a box, to be used instead of a *proper* sewing-press ; the accompanying illustration in Fig. 21 may facilitate the explanation.

End Papers.—When a book is sewn, the first thing to be done is to make and put on the end

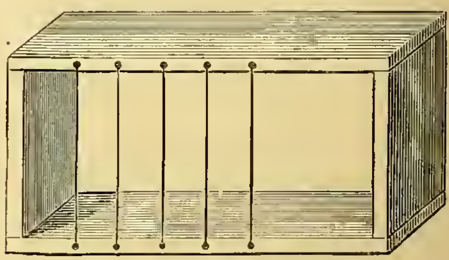


FIG. 21.—SUBSTITUTE FOR SEWING PRESS.

papers, or ends, as they are technically called. The amateur can use any fancy or plain paper he wishes, always with due regard to good taste. The various patterns are numerous, and as there is generally a pattern-book hanging up at the various material shops, a choice can be readily made : the price varies according to the colours, patterns, and size. The size most suitable will be found to be demy, the price ranging from 9s. to 95s. the ream, or from 6d. to 5s. per quire. I here give a brief notice of a few papers

used in bookbinding, that the novice may know what to ask for.

Cobb Papers are used generally for half-binding with sprinkled edges. The paper is stained throughout in the manufacture, and the light chocolate is the one most fancied. It is called *cobb*, after the name of a binder who used it on his books. The paper was made by a manufacturer who, not being able to find a market for it, sold a large quantity cheaply to Mr. Cobb; the trade seeing it on Cobb's bindings, took a fancy to it, and called it cobb paper, to distinguish it from other papers; and the manufacturer, instead of having a loss, found it was as much as he could do to supply the market. Price 9s. per ream, demy.

Surface Paper is prepared on one side with a layer of colour. This paper is used mostly on prayer-books, Bibles, and theological books.

Printed, or Fancy Paper, is coming very much into vogue. Some of the patterns are very pretty, and the amateur might use these with very good effect. Messrs. Corfield, of *St. Bride Street*, *Ludgate Hill*, have a very good selection, the price varying according to the paper and pattern.

Marble Paper is used more extensively than any other. Some of the patterns are exceedingly pretty; others, again, are very insipid; but the choice of patterns must be left to the amateur, for what the one would call pretty, the other would cry against. Although the manufacture of marble paper is within the sphere of bookbinding, this branch, like book-edge gilding, is very seldom done in the binders' shop, there being houses who do nothing else but either book-edge gilding or marbling. There is no doubt that marble paper was first introduced into England from Holland, wrapped round small parcels of Dutch toys. After being carefully smoothed out, it was sold to bookbinders at a very high price, who used it upon

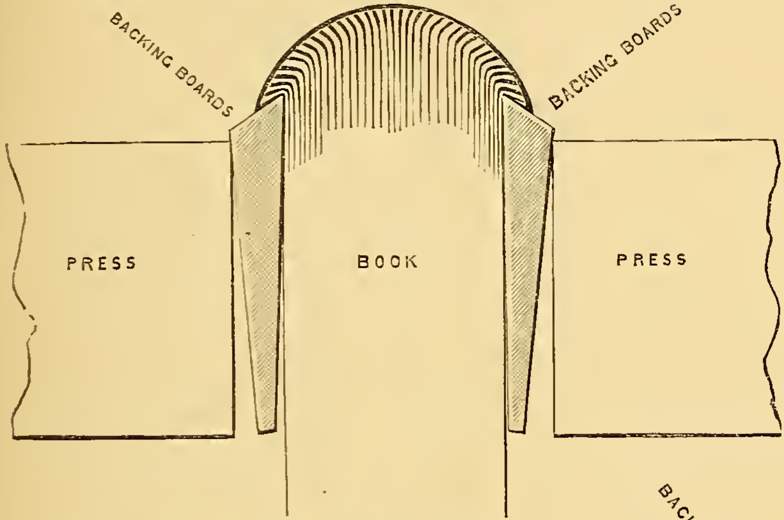


FIG. 25.—SECTION OF BOOK IN PRESS AFTER BACKING.

FIG. 22.—KEY FOR SEWING PRESS.

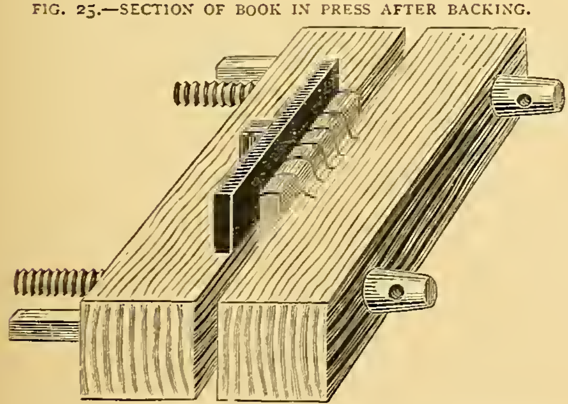


FIG. 23.—MODE OF PUTTING BOOK IN LAYING PRESS, WITH KNOCKING DOWN IRON AGAINST WORK.

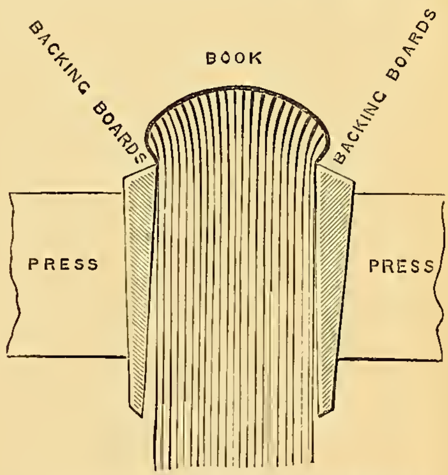


FIG. 24.—SECTION OF BOOK IN PRESS BEFORE BACKING.

their extra bindings; and if the piece was not large enough, they joined two or more together. After a time, the manufacture was introduced into England; but either the colours are not prepared the same way, or the paper itself may not be so suitable; anyhow, the colours are not brought out with such vigour and beauty, nor do they stand as well as on the old Dutch paper. Some secret of the art has been lost, and it baffles our ablest marblers of the present day to reproduce many of the beautiful examples that may be seen on some of the old books. Marble paper may be purchased from any of the binders' material sellers, from 1s. per quire, according to quality. Messrs. Corfield, *St. Bride Street*, *Ludgate Hill*, have some very good patterns, and, having their own marblers, make any pattern to order. Again, Messrs. Eadie, *Queen Street*, *W.C.*, have just introduced what they term *gold marble;* that is, a gold vein intermixed with the colours, giving a very excellent effect; and the price being no more than best marble, is within the reach of the amateur. Although it will be found to be far cheaper to buy marble paper than to make it oneself, I shall try, in some future paper, to explain how the amateur may make his own marble paper and marble his own book-edges.

My readers should have now a fair idea of the various papers used in the trade; and it will be advisable if he has a few sheets of the various papers he fancies by him, keeping them carefully in a portfolio with some white and toned demy and royal.

The end papers are made by pasting the half of a marble or fancy paper to the half of a white. Take some marble paper and fold two pieces to the size of the book, treat two pieces of white or toned paper the same. A white or toned folded paper is laid down on an old millboard, which we shall call for the future a pasting-board, and with moderately thin paste the folded white is pasted very evenly. The two fancy or marble papers are laid on the top, quite even with the back or folded edge. The top fancy paper is now to be pasted, and the other white laid on that; they must now be taken from the board, and after a squeeze in the press between pressing-boards, taken out, and hung up separately to dry. A piece of thick string fastened from one side of the room to the other will be found very useful to hang the end papers on. When they are dry, they should be folded in the old folds and pressed for about a quarter of an hour. When there are more than one pair of ends to make, they need not be made one pair at a time, but ten to fifteen pairs may be done at once by commencing with the one white, then two fancy, two white, and so on, until a sufficient number has been done, always pressing them to ensure the surfaces adhering properly, and hanging them up to dry. When dry, press again, to make them quite flat. The amateur may find that pasting is not quite so easy as it seems. To paste properly the brush should be well drawn over the paper, and away from the centre towards the edge of the paper; don't have too much paste in the brush, but just enough to make it slide well; be careful that the whole surface is pasted, and remove all hairs or lumps from the paper, or they will mark the book; never attempt to take up the brush from the paper before it is well drawn over the edge of the paper or it will stick to the brush and turn over. The book must now be prepared to have the end papers pasted on. Should the book have too much swelling, it must be tapped down gently with the hammer. Hold the book tightly at the fore-edge with the left hand, knuckles down, rest the back on the press, and tap the back gently with the hammer. This requires to be carefully done, for if the book is not held tightly some of the sections will slip in at the back, so the amateur had better trust to his press rather than the strength of his wrist. Knock the back flat on the laying press, and place the book in the press without boards with the back projecting; screw the press up tightly, so that the sheets cannot slip. A knocking-down iron should then be placed against the book on its left side (Fig. 23), and the back hammered against it; the slips or cords must now be pulled tight by holding the one side tightly against the book with the left hand and pulling the other end with the right. Should it happen that a slip is pulled out nothing remains but to resew the book, except, perhaps, if it be a thin one, it may possibly be re-inserted with a large needle; but this will not do the book any good, it strains the thread, thus making the sections loose. The slips being pulled tight, the first and last section should be pasted to its neighbour. Lay the book on the edge of the press and throw the top section back, lay a piece of waste paper upon the next section about $\frac{1}{8}$ or $\frac{1}{4}$ inch from the back, according to the width of the overcasting and size of the book, paste the space between the back and the waste-paper, using generally the second finger of right hand, holding the paper down with the left. When pasted, the waste paper is removed and the section put back evenly with the back of the book, which is now turned over carefully that it may not shift, and the other end treated in the same manner. A weight should be put on the top, or if more than a single book one should lie on the top of the other, back and fore-edge alternately, each book to be half an inch within the fore-edge of the book next to it, with a few pressing boards on the top one. Should the books be of various sizes, a board must be placed between each different size. When dry, the end papers are to be pasted on. A single leaf of white paper is cut, one

for each side of the book. The end papers are to be laid down on a board, or on a piece of paper, on the press to keep it clean, with pasted or made side uppermost, the single leaves on the top. They should then be fanned out evenly to a proper and equal width, about $\frac{1}{4}$ of an inch for an octavo, a piece of waste paper put on the top, and their edges pasted. The cords or slips being pressed back, the white fly is put on the book a little away from the back, and the made ends on the top even with the back; a few boards or weight of some kind is placed on the top and left till quite dry.

When dry, the ends should be broken back to the pasting and the slips unravelled and scraped, using a bodkin for the unravelling, and the back of a knife for scraping: the object being that they may with greater ease be passed through the holes in the millboard, and the bulk of the cord be more evenly distributed and beaten down, so as not to be seen after the book has been covered.

Glueing Up.—The book must now be glued up; that is, glue applied to the back to hold the sections together, and make the back firm during the rounding and backing. Knock the book perfectly true at its back and head, and put it into the laying press between two pieces of old millboard; it will perhaps be better to knock the boards and book up together, especially if the boards have been squared, the slips lying close to the book, then with hot thin glue rub well into the back with the glue brush, assisted with the back of the hammer, the overplus taken off again with the brush. The book must now be carefully taken out of the press so that the sheets are not shifted, and allowed to get dry. About one hour will be sufficient, but on no account should it be placed before the fire, as the heat from the fire causes the glue to get brittle. Should the glue get too dry a damp sponge passed over the back will be found of great benefit, the rounding being facilitated if the glue retains its flexibility.

Rounding.—Rounding applies to the back of the book, and is preliminary to backing. The book is placed upon the laying press with the fore-edge towards the workman. The left hand should be placed flat and open upon it, the thumb on the fore-edge; with the four fingers the leaves or rather the whole of the book must be drawn forwards, and with the right hand, the back beat lightly with the flat or face of the hammer, beginning in the centre of the back, still drawing the back over with the left hand. The book is then to be turned over and the other side treated in the same way, and continually changed or turned from one side to the other until it has its proper form, which should be a part of a circle. When sufficiently rounded, it should be examined to see if perfectly level, by holding the book up and glancing down its back. The thicker the book, the more difficult it will be found to round it; and some papers will be found more obstinate than others, so that great care must be exercised both in rounding and backing, as the fore-edge when cut will have exactly the same form as the back.

Backing.—The boards required for backing, called backing-boards, should be as near as possible, the same length as the book. They are made somewhat thicker than cutting-boards and have their tops planed at an angle, so that the sheets may fall well over, and it will perhaps be advisable if a piece of iron be screwed to the tops to prevent their wearing, and so save the amateur the trouble of replaning. Both sides being then properly rounded, one of the backing-boards is placed upon the volume at an equal distance from the back, taking the edge of the top sheet as a guide, the distance to be a trifle more than the thickness of the millboards intended to be used; then turning the book and board carefully so that it does not shift, the other is placed in a similar manner, and the whole put carefully into the press (Fig. 24). Should the boards have shifted during the process, they may be put straight while the press is holding the whole. When quite true, the press must be screwed up as tight as possible with the press-pin. The back of the book must now be gently struck with the back of the hammer, holding it slanting, and beating the sheets well over towards the backing-boards. The back is to be finished with the face of the hammer, bringing the sheets well over on the backing-boards, so that a good and solid groove may be made (Fig. 25). When backed the book should be as shown in Fig. 13, in page 363 of Volume I. of this magazine.

(*To be continued.*)

BRAZING AND SOLDERING.

By *GEORGE EDWINSON.*

I.—SOFT SOLDERING.

IF it were possible to collect statistics concerning the many household articles consigned to a premature tomb for want of a bit of soft solder, we should find that many tons of metal in the course of a year are wastefully buried in the earth. In our towns the travelling tinker rescues many hundreds from the dusthole, and picks up a respectable livelihood out of the twopenny jobs of soldering done by him in the street, whilst he saves many a sixpence for his patrons by his timely call upon them. But, in remote country villages, farms, and hamlets, his visits are few and far between, and the rag-plugged pot becomes too far

gone to be cured when the pot doctor calls to mend it. Much of this waste might be prevented by the timely application of the soldering iron to a small leak, and the art of applying it is so simple as to cause surprise, that it is not universally known. On almost every farm, and in most labourer's dwellings, may be found tools for doing a little amateur carpentering, shoe-mending, and tailoring, but the use of the soldering iron is known to only a few persons connected with the sheet-metal trades. Letters received by our Editor, personal inquiries addressed to me privately, together with requirements arising out of instructions given in other articles to solder metals, have shown me the necessity of giving a series of short articles under the above heading, to supply a want so universally felt and expressed.

In this series I propose to deal briefly with all the requirements of the amateur under this head, with the exception of those more fully dealt with by the author of "Practical Gas-fitting," and those specially related to plumbing. Commencing with the easier task of soft soldering, I intend leading my readers on to the more difficult jobs of hard soldering under the blowpipe flame, those of uniting metals by the process known as brazing, and then, perhaps, treat of the methods of joining metals by welding, burning or autogenous soldering.

The necessary tools for soft-soldering are at once the most simple and least costly of any trade plant—in fact, boxes of soldering tools, which contained all the requisite materials for stopping a leak in a tin pot or saucepan, have been sold in the street for the modest sum of 1s. From an examination of a few specimens of those soldering tools I would not advise the amateur to place implicit trust in them, for the soldering irons are irons in reality, and the solder is the softest "tommy" ever made. I have already said that the tools are simple, and I will add, that the amateur may easily make all of them himself, out of homely materials. The tools are: 1, a soldering iron; 2, a scraper; 3, a file; 4, a small phial of spirits of salts; 5, a strip of soft solder; 6, a box of powdered resin; 7, a candle end; 8, a few scraps of roofing zinc; 9, a sheet of emery cloth; 10, a tin box to hold the above articles.

The Soldering Iron is one of those misnomers so often met with in lists of technical terms, for, its essential part is not made of iron, but of copper. The usual method of making this tool is as follows: Get a 3 inch length of ¾ inch copper bar, and forge or file one end to the shape shown in Fig. 1. Then file the other end as shown at Fig. 2. Next procure a 5 inch length of ½ inch square bar iron, heat one end in the forge fire, and split it with a cold chisel, as shown at Fig. 3; forge the two ends of the fork flat to fit the end of copper, Fig. 1, and forge the other end in the form of a tang, Fig. 4. The forked end clasps Fig. 1, as shown at Fig. 5, and is attached thereto by copper rivets through holes drilled through the iron and the copper, and the tanged end is inserted in a file handle to form the perfect tool shown at Fig. 6; this is the most common form of soldering iron, some others are shown at Figs. 7 and 8. Soldering irons made in this way have the disadvantage of being liable to derangement from splitting of the wooden handle. This is caused by the heat of the tang in contact with the wood. To obviate this defect a friend of mine devised a method of attaching the copper, which not only improves the tool, but makes it more simple to the amateur manufacturer. The copper bit is attached to a 5 inch length of ⅜ inch gas barrel by drilling and tapping a hole in the copper, and screwing it on the gas barrel; the other end of this is screwed into an expanding union, which forms a ferrule for the wooden handle. To ensure additional strength, the handle is bored to receive a short piece of ⅜ inch iron rod, one end of which is screwed and fitted to the interior of the ⅜ inch gas barrel, and the other end is fitted with a slotted nut inserted in the end of the wooden handle. To ensure a clear perception of the plan, the whole is shown in section at Fig. 9. This plan may be adapted to the ordinary copper bit, by using a piece of ½ inch gas barrel, splitting one end as a substitute for Fig. 3, and riveting it to the copper. If the wooden handle shrinks and allows the ferrule to get loose, a turn or two of the nut will tighten all up again, and a few small holes bored in the gas barrel shank will materially assist in keeping the handle cool.

The Scraper may be only an old pocket-knife, or an old saw file forged flat at one end and bent into the form of Fig. 10A, or a piece of a reaping machine knife with a hole punched in the centre to admit an iron tang being riveted in it, like a ship's scraper, Fig. 10B, or a steel-bladed scraper, as shown at Fig. 10A. Its use is to scrape off all patches of solder and to scrape oxidised metal and dirt out of crevices where we wish the solder to run.

The File may be an old saw file, or a small flat file, costing from 4d. to 6d.; its use being only to file down any roughness or inequality on the article which may prevent making a smooth joint.

Spirits of Salts.—This, and its congener, "killed spirits," is another misnomer. The first is not a spirit, but an acid, named hydrochloric acid, and commonly known as "muriatic acid," whilst the second is a solution of chloride of zinc. A pennyworth of hydrochloric acid will last for a long time. Put half of it into a clean marmalade or jam pot, or old mug, stand it in the open air, and put in a few scraps of clean roofing zinc; the acid will attack the zinc, part of it

(the chlorine) uniting with the metal to form chloride of zinc, whilst the other part (hydrogen) is thrown off into the air as a gas; avoid breathing this stinking gas, for it is hurtful. Add zinc until the acid will dissolve no more, the liquid is then called "killed spirits;" add a wine glassful of rain water to it, bottle it up and label it (if inclined to be scientific) *chloride of zinc—poison.* The crude acid will be required in soldering articles made of zinc, whilst the "killed acid," or chloride of zinc, will be wanted in soldering those made of copper, brass, tin, and iron.

Resin, or rosin (or "rozum," as it is vulgarly termed) is sometimes used instead of chloride of zinc as a flux in soldering articles made of tin, pewter, and

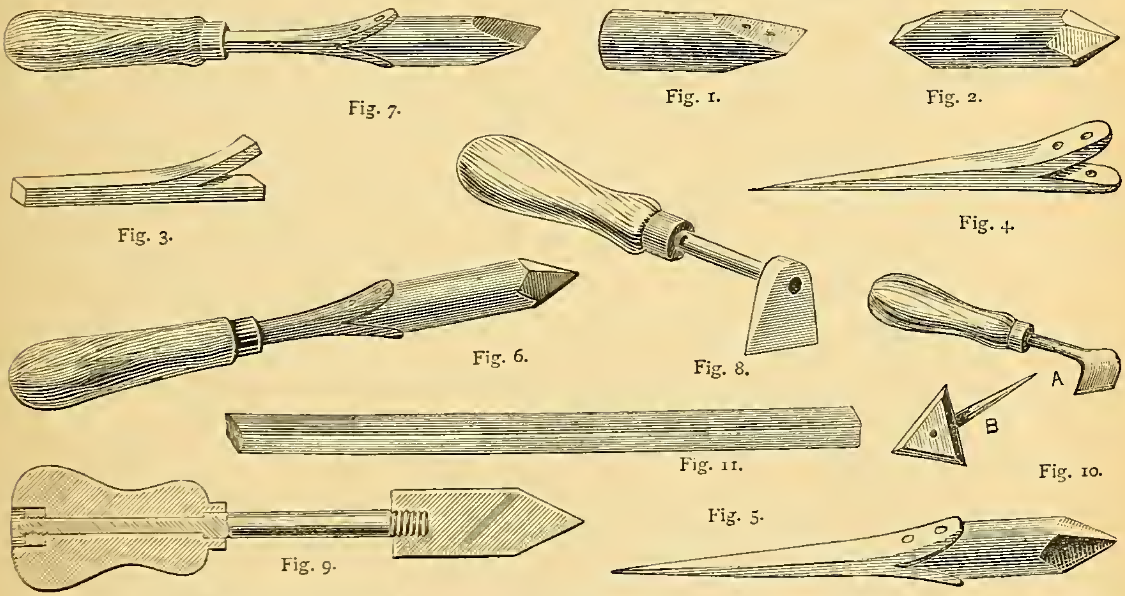


FIG. 1.—COPPER BIT, ONE END FILED. FIG. 2.—COPPER BIT, TWO ENDS FILED. FIG. 3.—IRON SPLIT TO RECEIVE COPPER BIT. FIG. 4.—IRON FORGED TO SHAPE. FIG. 5.—IRON SHANK FITTED AND RIVETED TO COPPER BIT. FIG. 6.—SOLDERING IRON, WITH HANDLE COMPLETE. FIG. 7.—CHISEL-SHAPED SOLDERING IRON. FIG. 8.—HATCHET-SHAPED SOLDERING IRON. FIG. 9.—IMPROVED SOLDERING TOOL. FIG. 10.—SCRAPERS. FIG. 11.—STRIP OF SOFT SOLDER.

Britannia metal, whilst it is the best flux for soldering those made of lead, and the kind of gas-pipe known as "compo." A pennyworth of the common black resin crushed and put into a small tin box or a wooden pill box, will be quite sufficient.

Soft Solder.—This term may be said to cover at least a dozen different alloys of tin, lead, and bismuth, ranging in fusibility from a temperature of 200° Fahr. up to 800° Fahr. The following list of very soft solders, with their fusing points, is taken from *Calvert's Mechanics' Almanack for* 1876.

Bismuth Solders.

1. Bismuth 3, tin 5, lead 3 parts. Melts at 202° Fahr.
2. Bismuth 2, tin 1, lead 2 „ „ 236° „
3. Bismuth 1, tin 2, lead 2 „ „ 292° „
4. Bismuth 1, tin 3, lead 3 parts. Melts at 310° Fahr.
5. Bismuth 1, tin 4, lead 4 „ „ 320° „
6. Bismuth 2, tin 3, lead 4 „ Pewterer's Solder.

Tinner's fine solder, fusing point 340° Fahr., made from an alloy of tin 2, and lead 1 part, and tinner's common solder, fusing point 334° Fahr., made of tin $1\frac{1}{2}$ and lead 1 part, comes next on the list, and are the two solders usually denominated soft solders. As I shall give the proportionate parts of solders as I proceed, when treating of the metals and alloys to be soldered with them, it will not be necessary to extend the list, so I will briefly give general directions for casting sticks of solder. All solders should be melted twice. The first time of melting, the most infusible metal should be put in first, and when this is hot the next should be added; in those above mentioned, the order should be, lead, tin, bismuth; when all are melted together, the melted mass must be poured from the ladle into a pail of cold water to granulate the alloy or form it into grains. These grains must be collected, returned to the ladle and melted again, and when the metal is fit to be poured, it is run into long semi-cylindrical moulds to form strips. A long groove in a flag stone, or an elder stick with the pith cleaned out, or half of a small iron gas-pipe with the inside smeared with tallow, will serve the purpose of moulds for soft solder. When poured in chinks between stones, or run in sand, the solder is apt to be mixed with grit. An old iron spoon will do as a ladle for small quantities, and a small crucible will serve the

purpose very well, but soft solders are best melted in iron ladles with lips and long handles. Whatever is used, be sure that it is quite free from zinc, for this metal will ruin soft tinman's solders, and there are tinmen who believe that even a smell of zinc will spoil a pound of solder. Soft solders may be easily melted in a ladle over the kitchen or any other fire, but some of the hard solders will require a crucible and a furnace. I have found those mentioned by Mr. Fletcher in page 185, Vol. I., to be very handy little contrivances for the purpose where gas is burnt. Hard solders require to be granulated, and then crushed in a mortar after the first melting, to ensure a perfect mixture of the metals.

Strips nine inches long are convenient lengths for the solder. A tin box, about a foot long, 5 inches deep and 4 inches wide, will be handy to keep the tools in, and an old duster will serve the purpose of keeping them quiet, besides being useful for some other operations.

With a few articles and tools such as those, we will commence a few lessons on soldering, to be given in my next article.

WAYS AND MEANS.

[The Receipts brought together under this title are gathered from various sources. They are given here because they are each and all apparently possessed of value, and likely to be useful to the Amateur. It is manifestly impossible for the Editor to test them, or to have them tested, and he therefore disclaims all responsibility for their accuracy or otherwise. Amateurs who may try them are requested to communicate the results arrived at.]

Why Stone Walls are Damp.—The walls of a stone house, and sometimes of a brick house, are covered with dampness. This is due to the very same cause by which dew is deposited on grasses, or moisture on the side of a glass or pitcher that is filled with ice water and is brought into a warm room. The walls become cold, and as stone is a non-conductor of heat, they remain cold for a long time. When the weather changes suddenly from cold to warm the air becomes filled with moisture, for the warmer the air is the more moisture it will absorb. When this warm air strikes the cold wall, the moisture is deposited on it from the air, which is suddenly cooled by contact with the walls, and as the warm air is continually coming in contact with the walls. and as the warm air is continually in contact with the walls, the dampness accumulates until it appears like a dew upon them, and pours down in streams at times. It is easily prevented. No plaster should be put directly upon brick or stone, but furring strips should be nailed to the wall and the laths be put on these. Cellars are frequently made very damp in the same way by too much ventilation in warm weather.

Plum Stocks for Peaches.—It is said that it has been observed that trees in the peach gardens of France, grafted on plum stocks, ripen their fruit ten days earlier than the same variety grafted on a peach stock.

New Mode of Covering Floors.—A new and apparently desirable method of covering floors is described as follows:—The floor is first thoroughly cleaned. The holes and cracks are then filled with paper putty, made by soaking newspapers in a paste made by thoroughly mixing wheat flour, ground alum, and water, in the proportion of one pound of the first and a tablespoonful of the second to three quarts of the third. The floor is then coated with thin paste, and then a thickness of manilla or hardware paper is put on. If two layers are desired, a second covering of manilla paper is added. This is allowed to dry thoroughly. The manilla paper is then covered with paste, and a layer of wall paper of any style or design preferred is put on. When this is thoroughly dry, it is covered with two or more coats of sizing, made by dissolving half a pound of white glue in two quarts of hot water. After allowing this to dry, one coat of hard oil-finish varnish is given to the surface. The process is certainly inexpensive, and it is said to be durable. Besides taking the place of matting, carpet, oil-cloth, or other like covering, it makes the floor air-tight; and it can be washed like any ordinary floor.

Hanging Flower-Pots.—A pretty little hanging flower-pot is easily made from a cocoa-nut shell. There are divisions in the shell, plainly marked by slight ridges which mark out its surface into three equal parts. Burn a hole in each of these, about half an inch from the edge, after sawing off the top. Fasten some copper wire of equal length into the holes, to afford the means of banging it up. Put some bits of charcoal, or bits of broken flower-pot, at the bottom, and fill up with earth. Place some pieces of small ivy or creeping-jenny to trail over the sides. Baskets made in this manner afford ornamental additions to a conservatory.

Saltpetring of Brickwork.—One of the great trials which the builder has to endure is the "salpetring" of the brickwork, or the white streaks which too often disfigure the fronts of brick buildings. It is worth noting that this can usually be prevented by adding oil to the mortar at the rate of a gallon to the cask of lime. Linseed oil is generally used, but any kind will do which does not contain salt. If cement is used in the mortar, an extra gallon of oil must be used for each cask of lime. When the incrustations have once formed on a building, they cannot be permanently removed, though they can be for a time by washing with hot water or the muriatic acid generally used for washing down brickwork.

NOTES ON NOVELTIES.

IN addition to various useful tools and appliances, I find that again I have several trade catalogues, to which it is desirable to call attention for the benefit of my readers. Among these, the first that offers itself to notice, happens to be the "Descriptive and Illustrated Price List of Photographic Materials," issued by Messrs. W. W. Rouch & Co., 180, *Strand.* The price of this *vade mecum* in photography is 6d., and all amateurs who are interested in the art of making pictures by the agency of the sun's light, will do well to buy it and keep it by them. Messrs. Rouch and Co. supply a Patent Portable Camera for dry plate (or wet collodion) landscape work, which possesses the merits of extreme lightness, and perfect rigidity when in use. Some idea of its portability may be given by stating that the weight of the camera for 6½ by 4¾ inch plates is only 2 lbs. 4 ozs., and of that for 8½ by 6½ inch plates is no more than 3 lbs. 6 ozs. The camera in its simplest form, with vertical swing to back, effected by a novel and ingenious arrangement, costs, for the smaller size mentioned above, with one wet collodion back for plates, £4 4s., the double back for dry plates being £1 2s., the larger size costs £4 17s. 6d., and the double back to suit size, £1 7s. Side swings can be added to these cameras at an additional cost of £1, and reversing frames, at a cost of 16s., to enable pictures to be taken vertically or horizontally, without altering the position of the camera. Sling cases, and tripods to carry and support the cameras when in use, can be had at prices from 16s. for the former, and 22s. for the latter. Another speciality of Messrs. Rouch and Co. is the Tourist's Pocket Set, which combines every requisite for taking pictures out of doors, and is sold according to size of plates, at prices ranging from £11 5s. to £21 10s. For the fittings comprised in this useful apparatus for dry plate work, and for a description of Rouch's New Universal Operating Box, and Rapid Gelatine Plates for studio and landscape work, I must refer my readers to the price list itself.

Messrs. Marion and Co., 22 and 23, *Soho Square, London, W.*, send me their price list of appliances for photography. Some of the specialities of this firm have been mentioned by Mr. Archer Clarke in his paper on "Photography," in Part 11 of AMATEUR WORK, and I need do no more here than call attention to "The Beginner's, or Student's Photographic Apparatus," complete with lens, camera, stand, chemicals, lamp, trays, etc., for 50s., an excellent working set at the minimum of cost, by which by the use of gelatine dry plates the process is rendered both much more simple and clean in the working. Extras for this apparatus, including portrait lens, leather case for camera, etc., when travelling or on an excursion, extra double slides, and various chemicals, can be obtained at equally low prices. Another speciality of this firm is their "New Patent Camera and Changing Box in One," the "Enjalbert," at prices ranging from £10 to £15 10s., according to size of plate, or in sets also according to size of plate, replete with every appliance, from £25 to £39. It is difficult in a few lines to give a reader even a limited idea of all that is contained in a prospectus, and anyone who is interested in the matter will do well to apply for the papers issued by Messrs. Marion and Co. with reference to the various kinds of photographic apparatus that they keep.

Messrs. D. H. Cussons and Co., *Manufacturing Chemists*, 79, *Bold Street, Liverpool, and at Southport*, send me a price list of outfits and photographic requisites manufactured and sold by them. The price list is prefaced with "Notes for the Amateur and Tourist," and "Concise Instructions in the Use and Manipulation of Cusson and Co.'s Liverpool Bromo-Gelatine Dry Plates, the Liverpool Instantaneous Shutter, etc," which are brief, clear, and pertinent, and will be found useful. Messrs. Cussons and Co. supply four descriptions of outfits, namely: the "Amateur's Set," for taking negatives 4¼ by 3¼ inches, and 5 by 4 inches, at £4 10s.; the "Artist's Set," for negatives 4¼ by 3¼ inches (carte de visite size), at £6 10s.; the "Tourist's Set," for negatives 6½ by 4¾ inches (cabinet size), at £9 10s.; and the "Military Officer's Set," for negatives 7¼ by 4¼ inches, at £14 10s. For extra fittings to these cameras and their prices and the prices of other materials and appliances, I must refer my readers to Messrs. Cussons and Co.'s price list, which will be forwarded to any applicant on receipt of an envelope stamped and addressed. It may be interesting to my readers to know that Messrs. Cussons and Co.'s "Extra Rapid" plates were supplied, by order, to the Staff of Sir Garnet Wolseley, for the Egyptian campaign of 1882.

Messrs. W. F. Hamley and Co., 231, *High Holborn, W.C.*, send me four catalogues—namely, an "Illustrated Catalogue of Working Model Steam Engines (separate parts), Mechanical Steamboats, Sailing Yachts, Magic Lanterns and Slides, etc.," a "Catalogue of Toys, Games, Scientific and Amusing Novelties," an "Illustrated Catalogue of Conjuring Tricks," and a "Price List of Tools and Materials for Buhl and Fretwork, Wood Carving, etc., Fret-Sawing Machines, Turning Lathes, Amateurs' Tools, etc." Although the nature and character of each of these catalogues is to a certain extent described by its title, yet they must be carefully read and examined in order to get an idea of even a tenth of the various articles that are described in them. The catalogue of conjuring apparatus gives accounts and illustrations of just upon 400 tricks and puzzles, a store from which the most exacting amateur conjuror could not fail to satisfy his wants. Many useful little appliances at low prices are mentioned in the catalogue of tools. A separate "List of Fittings for Model Ships" is issued by this firm, from which amateur ship-builders can ascertain the price of any particular fitting that they may require.

Amateurs who are thinking of adding a magic lantern to their stock of scientific apparatus and appliances should look at the new optical lantern called the Sciopticon, before doing so. This capital lantern, which in time cannot fail to supersede the old magic lantern, is manufactured and sold by the Sciopticon Company, 26, *Colebrooke Row, London, N.* One of its chief merits is that when any exhibition of pictures is being made, either for amusement at home in the

winter evenings or in the school-room for eductional purposes, the necessity for darkening the room, which was a *sine qua non* with the old magic lantern is altogether done away with. The Sciopticon, indeed, may be, and has been, used in a brilliantly-lighted room, without, in any way, impairing or weakening the effect of the pictures thrown on the screen· The darkened room may, in the eyes of some persons, tend to add to the piquancy and deepen the mystery of the exhibition, but it often had a bad effect on children, especially young children, who were nervous and timid; and, when the magic lantern was used to illustrate a lecture delivered to students, the listeners were prevented by the obscurity that encompassed them from taking notes. With the Sciopticon, however, no child need be frightened by the darkened state of the room, and no student prevented from using his pencil and note-book. The price of a Sciopticon complete, having best 4-inch condensers, selected double achromatic lenses, and on polished walnut base, the whole in a handsome lock-up travelling-case of stained wood, is £4 10s. nett cash. A pair of Sciopticons, with dissolver, is supplied for £10, or for £10 12s. with legs forming stand, 4 feet 9 inches in height.

It is possible that many readers of AMATEUR WORK, ILLUSTRATED, may, at one time or another, require castings and fittings for small engines, pumps, lathes, wood-working machinery, and other appliances for which special castings are required. If so, I am inclined to believe that they may soon get whatever they may require in this way by putting themselves in communication with Mr. A. A. Dorrington, *Engineer and Mechanical Draughtsman*, *West Gorton*, *Manchester*, who will furnish estimates and designs, if required, on application. I can bear testimony to the excellence of Mr. Dorrington's working drawings and castings, for he has submitted to me both drawings and castings, complete for a small horizontal engine, 3½ inches by 2 inches, which he supplies at 12s. 6d. per set, and for a model vertical engine, 2 inches by 1½ inches at 5s. 6d. per set. The castings, of course, are in the rough, and require planing, filing and fitting. In the horizontal engine, the steam and exhaust ports are cast in the cylinder, thus saving a large amount of labour in drilling them out, and the consequent risk of damage to tools, such as breaking drills, etc.

Messrs. F. H. Sanderson and Co., 7, *East Road*, *Cambridge*, send some excellent patterns for fret-work and scroll sawing, which are characterised by boldness and freedom of design, combined with lightness of appearance. Another good point about these patterns is that they are carefully drawn with the view of avoiding weak points, a desideratum in all designs for work of this kind. A comprehensive catalogue of machines, tools, and appliances used by fret-sawyers can be obtained from Messrs. Sanderson and Co., by forwarding a wrapper duly stamped and addressed. This price list contains a list of the fancy woods supplied by this firm, planed to a thickness ranging from ⅛ inch to ½ inch, at prices ranging from 5d. to 1s. 6d. per square foot, according to material and thickness.

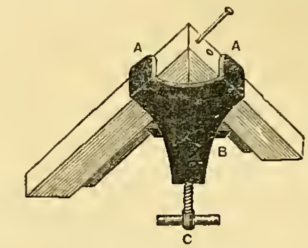


FIG. 2.—BOOTH'S CORNER CRAMP.

Amateur picture-frame makers will find an invaluable addition to their special tools for this work in the "Registered Mitre-Cutting Machine," invented and manufactured by Messrs. Booth Brothers, 63, *Upper Stephen Street*, *Dublin*, and sold by the inventors and makers, and by all dealers in wood-working tools and appliances throughout the kingdom. The nature of the machine may be seen from Fig. 1. From a solid bed A, which may be screwed down to a bench, in any convenient position, rises an equally solid frame B, the sides of which in the interior, lettered C, C, are placed at an exact angle of 45° to the exterior surface of the frame, and serve as a guide or directing surface against which the moulding is to be placed when subjected to the action of the heavy cutting knife D. Each side of the frame has a different direction, and would meet, if produced, and form a right angle. Thus the necessary arrangement is obtained for cutting the opposite ends of each side of a frame at the proper angle. Below the frame, and in continuation of it, is a piece of iron, E, which carries the cutting knife, which works on a bolt F, passing through this part of the machine, and the handle or lever to which the knife is attached. The knife itself is a thick double-edged blade, with a well-defined wedge-shaped edge of great keenness. The progress of the knife in either direction is checked by projections G, G, at the lower part of the piece E. When in use, the moulding is pressed, as shown in the illustration, against either side of the frame, as may be necessary, and the knife brought in contact with it, and driven through it by pressure at the upper end of the long lever handle. The action of the knife in no way injures the wood, gilt surface, or composition of the moulding, but cuts a mitre joint perfectly true in inclination, and as clean as if it had been finished with the plane, thus enabling the amateur picture-frame maker to dispense altogether with the use of the saw, plane, mitre-box, and shooting-board in making his frames. The cost of a

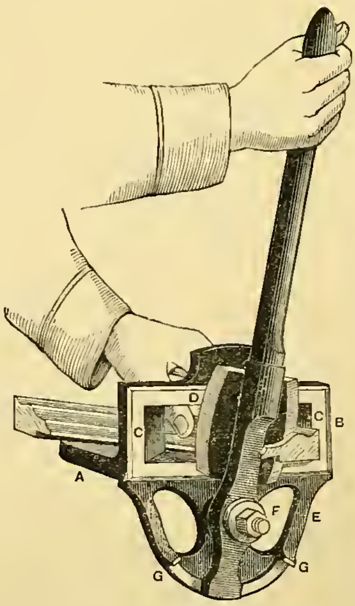


FIG. 1.—BOOTH'S MITRE-CUTTING MACHINE.

machine for cutting mouldings up to 2 inches in width is 15s., or with extra cutter, 17s. 6d. A larger machine for cutting mouldings up to 4 inches in width, and of great utility in cutting architraves and panel mouldings, is supplied for 30s, or for 35s. with extra cutter. The knife is easily removed for sharpening.

Another appliance, as indispensable to amateur picture-frame makers as the mitre-cutting machine described above, is the Registered Corner Cramp, invented, made, and sold by the same firm. The form of this cramp, and the way in which it is used are shown in Fig. 2. The ends of any two adjacent pieces of moulding that have been cut to the proper angle of 45° in the mitre-cutting machine are inserted between the fixed jaws of the corner cramp at A, A. They must be brought together in close contact, and care must be taken that they do not shift, while the pressure plate B is being brought firmly against them by the action of the screw C. This being done, the ends of the pieces of moulding are held immovably together, and they may then be securely nailed together, and the pressure of the screw relaxed, and the cramp removed to be applied to the remaining corners of the frame in turn. The cramp is supplied in three sizes—No. 1, to take $1\frac{3}{4}$ inch mouldings, at 2s. per pair; No. 2, to take 3 inch mouldings, at 3s. per pair; and No. 3, to take 4 inch mouldings, at 5s. per pair. A sample cramp, No. 1, is supplied, post free, for 1s. 3d. The postage of a pair of No. 1 is 4d., of a pair of No. 2, 1s.

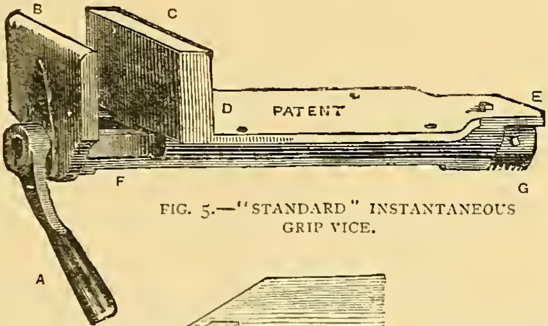


FIG. 5.—"STANDARD" INSTANTANEOUS GRIP VICE.

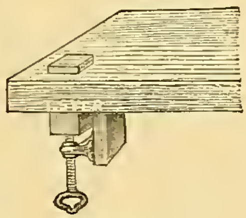


FIG 4.—BENCH STOP WITH SCREW ADJUSTMENT.

Amateur wood-workers who are in quest of a thoroughly good and useful carpenter's bench, of English make, will do well to pay a visit, if possible, to Mr. Thomas J. Syer, of 1, *Finsburv Street*, *Chiswell Street*, *E.C.*, and examine his Registered Portable Cabinet Bench. No one who sees it can fail to be pleased with it, and to acknowledge that it is unequalled for lightness of structure, compactness, and capability of easy removal from place to place. Fig. 3 will give country readers, whose visits to London may be few and far between, a good idea of the appearance of the bench and its fittings, and I can assure any such who may be inclined to purchase without prior inspection, that they will be in every way satisfied with their bargain when they have got it. The bench may be described as a composite bench, being formed of an iron stand or bed, made in separate pieces, and put together with screw bolts, and a wooden top. The supports or standards are also attached to the top with screw-bolts, and when put together the whole structure is firm and rigid, thus affording the chief *desiderata* that should be looked for in any bench, whatever may be its form and the principle on which it is made. The bench, when put together, is of the ordinary height, and the top, which is made of sound white deal, traversed from side to side with three iron bolts to prevent any chance of warping, is 6 feet by 1 foot 10 inches. The fittings consist of the "Standard" Instantaneous Grip Vice instead of a bench-screw, and a screw rising stop, which obviates all hammering from below, which is necessary in order to raise the ordinary bench stop, and will invariably tend to damage the under side of the bench. The screw top can be easily regulated to any height required, and can be raised or lowered, as the case may be, to $\frac{1}{10}$ inch above the level of the bench top. The price of the Cabinet Bench, complete, of the size described, is £3 12s. A smaller size is made, nominally for amateurs, of which the top is 4 feet 6 inches by 1 foot 6 inches, and sold with fittings, as

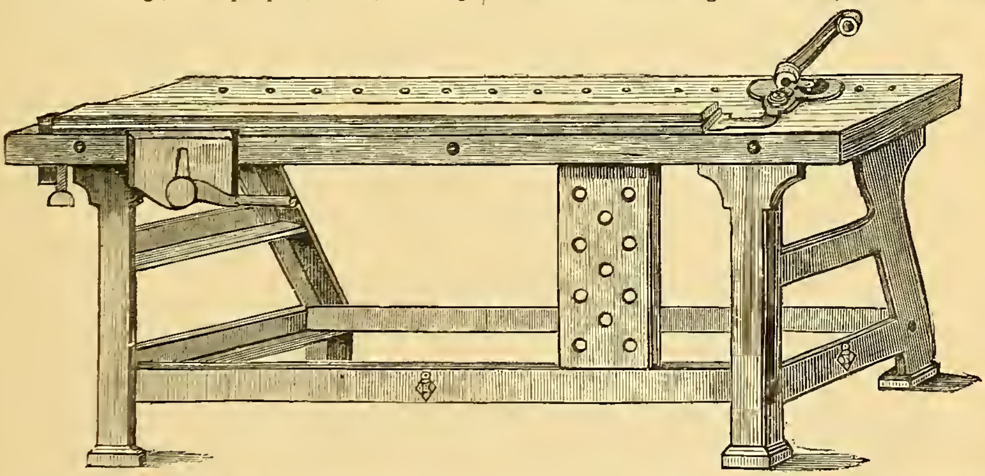


FIG. 3.—SYER'S REGISTERED PORTABLE CABINET BENCH, WITH "STANDARD" INSTANTANEOUS GIRP VICE AND BENCH KNIFE.

described above, for £3 3s. It is better, however, for buyers to purchase the larger bench unless they happen to be restricted in room.

On examining the illustration an upright piece of wood will be noticed to the right, perforated with holes to take a peg wherever it may be necessary to support a piece of board one end of which is held in the grip vice. The space between this and the standard to the left can be partly filled with a nest or small chest of five drawers—one large one at the bottom, and two tiers each containing two smaller drawers above. These chests are 22 inches long by 18 inches high, and 16 inches deep, and are supplied with the bench at a cost of 35s. extra. If not required, the ledges within the standards, which are shown in the inside view of the standard to the left can be utilised as supports for boards on which saws and other large tools can be laid when not in use. Another useful adjunct to the bench is the Joiner's Patent Bench-Knife, supplied by Mr. Syer at 3s. 6d. This bench-knife consists of a small bed-plate, having two pins on the under side to drop into holes made in the top of the bench to receive them, and an arm or knife for holding the work firmly between itself and the bench stop, the arm being pushed and held against the work by the action of a small lever handle and cam attached to the upper surface of the bed-plate. This plate is only 9 inches by 3½ inches, and the weight of the entire appliance is only 2 lbs. The knife works smoothly and easily on the surface of the bench-top, and never injures it by cutting into it as is frequently the case with the ordinary bench-knife.

The bench-knife is shown in position in Fig. 3, on the bench-top to the right of the illustration, which fully explains its action, a piece of wood being shown on the bench-top, firmly held between the knife itself and the bench-stop. The row of holes near the inner edge of the bench-top show how provision is made for using the bench-knife with various lengths of wood. It should be said that the perforated piece of wood in front of the bench to which reference has been already made, slides backwards and forwards between the bench-top and the lower rail of the frame at pleasure. It is by no means absolutely necessary, for the grip of the vice is so strong that it will hold in place a long piece of board, so that it may be planed with ease without any additional support from a peg thrust into any one of the holes, as the width of the board may require. The formation and action of the bench-stop is shown in Fig. 4. The stop itself is a rectangular block of wood, cut and fitted to the top of the bench in such a manner that the side nearest any piece of wood that is brought against it slopes slightly so as to bring a slightly projecting edge against the wood at the top. The screw has a plate at the upper end, which is let into, and held with, screws to the lower end of the bench-stop. It works in an internal screw, cut in a projection at the back of a small iron bow, each end of which is screwed to a block of wood attached to the under side of the bench-stop. The price of the iron fitting for bench-stop is 1s. 2d. If any amateur prefers a bench-top made of beech instead of white deal, he must add from 12s. to 15s. to the cost of the bench as given above.

An illustration of the "Standard" Instantaneous Grip Vice is given in Fig. 5. The following description of it is extracted from "Every Man His Own Mechanic": "The workman has simply to raise the lever or handle A to a perpendicular position with the left hand, and draw out or close, as may be necessary, the front jaw B the necessary distance. He must then place the piece of wood, or other material on which he is about to operate, between the jaws B and C, after which he must press the front jaw B nearly close to the wood, then press down the lever, when the wood will be held firm in the vice. To remove the piece of wood he must raise the lever as described above. The grip is caused in the following manner: On the under side of the plate, on which the word "patent" is marked in the illustration, and in the straight line that lies between the letters D, E, is a plate indented with a row of V-shaped depressions inclined at a slight angle to its sides, being in fact, to describe it as accurately as possible, a longitudinal strip cut out of a female screw. At the end G of the bar F G, which is held in position, and travels in and out between two curved flanges projecting from the under side of the plate, is a short cylinder which is grooved along part of its surface after the manner of the threads of a screw, the remainder being left plain, and carrying a stop or stud which is shown in the engraving, and which prevents the progress of the screw beyond a certain point so as not to cause injury to any substance placed within the powerful bite of the jaws. When the piece of wood, or any other material, as the case may be, has been placed within the jaws, and the front jaw pushed *nearly close* to it, the downward turn of the lever or handle brings the threads of the male screw within the threads of the female screw, and *draws* the front jaw against the wood so tightly, and with so firm a grip, that it is utterly impossible to remove the material without injuring it until the lever is raised and the pressure relaxed. It is the *drawing* action of the screw that gives value to the "Standard Instantaneous Grip Vice," by causing the pressure of the jaws to be brought *gradually*, though swiftly, to the point that is required to hold the material immovable within their grasp. The principal advantages of this bench-vice are: (1) that it grips and relaxes its hold instantly in any distance up to 13½ inches; (2) that the action and working of it are so complete that a piece of ordinary writing-paper can be secured and held as firmly as a piece of timber; (3) that it effects a saving of about 75 per cent. of the time employed in working the ordinary bench-vice by its easy action and certainty of its grip; (4) if wood facings are fitted to the faces of the iron jaws all possibility of indentation of the article placed in it is removed; and (5) that it can be fitted to any description of bench, new or old. The price of the vice is 18s, or if supplied with wood facings fitted to the jaws, 20s. As the jaws are of iron it is evident that the vice will serve the purpose of an iron bench-vice for holding pieces of metal, as well as that of an ordinary bench-vice for holding wood, and that the amateur who possesses one of these has no occasion to go to the expense of purchasing an iron bench hand-vice. By placing within the jaws two pieces of wood of sufficient length to hold a saw, this vice may be further utilised as a saw-vice.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Electrical Matters.

CHRISTMAS (*Gateshead*). — The only galvanic battery capable of being applied to the human body direct is that known as "Pulvermacher's Chain Belts," where a number of alternate links made of coils of zinc and copper wires, arranged alternately on strips of wood, are kept moist by acidulated flannel. I could instruct you how to make a similar belt, but am not so sure that you would succeed with my instructions, nor derive any benefit therefrom. Electrical currents are usually applied to the body through the medium of an induction coil. Such coils are not cheaply made, to be effective, but I shall have much pleasure in giving instructions for making one; such instructions, however, cannot be usefully condensed into this column. Your letter appears to conceal your real wish. What do you hope or wish for from the application of electricity? State clearly your case in another letter, then it shall receive my careful consideration, and I shall be most happy to advise you.

AMATEUR, R.M.L.I.—*Cutting Gas Carbon.*—Gas carbon can be cut with an old saw and a large expenditure of labour and patience. Fix the carbon in a vice, keep it moist with water, and saw away. You may use a strip of sheet-iron, or of iron hoop held in a frame like a hack-saw, or a revolving disc of the same metal, instead of a saw, and in this case employ wet sand in the cut as an auxiliary. It is a dirty job, but, if you disregard the dirt and the labour, it is one well within the compass of an amateur's ability.

E. C. C.—*Dynamo-Electric Machines.*—A description of one of those machines will be forthcoming shortly, when the principles of their construction will be fully described and illustrated. Meanwhile, I may tell you that an induction coil is not required with them.

NOR'-WESTER.—As breezy and sharp as a veritable nor'-wester, and argumentative withal; but none the less welcome on that account—in fact, I rather relish such criticism. Do not suppose for one instant that I declaim against the prices charged for bells by shops. The workman is worthy of his hire, and the tradesman deserves a fair profit on the goods he sells. When I said in p. 321, "It will be seen that a fair price for a really good English-made bell of 2½ inches in diameter is about 10s.; but the amateur may be able to procure the various parts, and, by the aid of directions given him here, make up a bell at about half this sum," it was not intended to imply that the parts could be procured from any one shop, or that the perfect parts should be bought at all. Taking Mr Dale's price-list as you have done, I find that he charges from 2s. 3d. to 5s. for a teak wood base and cover. Now the wood of this article does not cost half the above sums, the other half representing labour and profit, this last item the amateur can save by making the article himself. A similar and proportionate reduction may be effected by the same means on nearly all the other parts, and thus the amateur whose leisure is at present a drug and a source of discomfort to himself, may pleasantly and profitably employ his time. Mr. Dale is one of the fairest and best traders I have ever dealt with, and you cannot do better than to procure all necessary parts from him; but if money is scarce with you, you can economise as above indicated, by making some of the parts yourself out of the crude material.

ELECTRIFIED LAWYER.—Another welcome critic. Your observations on Fig. 41 are quite correct, and are in consonance with my own words in p. 453. A switch in the kitchen would necessitate a separate wire to each bell; it is best, therefore, to have a switch near each bell to throw it in or out of circuit as required. Thanks for information on Guzzot's battery; I will try it myself soon. Kindly let me know how you succeed with it. About two years since I went through a series of experiments having for their aim the providing a cheap, compact, and powerful battery to meet the requirements of a conjuror. After trying many and various forms of dry batteries, we fell back on the old and well-tried single fluid bichromate battery, with an arrangement for throwing the zincs out of the solution when the battery was not at work. Where expense is no object, Gaiffe's silver chloride battery is the best and most powerful of all dry forms of batteries. The cells are made of ebonite; each cell may measure only 5 in. by 3 in. by ½ in., and thus 10 cells may be made up in a compact case measuring only 6 in. by 6 in. by 4 in. The E.M.F. of each cell is about 1.2 volts, but the volume of current is small, and the charge is soon exhausted. Each cell contains a plate of silver as the negative element, on which is melted some chloride of silver in the condition known as "horn silver," and a plate of zinc as the positive element, separated from the silver by a piece of flannel moistened with a solution of chloride of zinc. Mr. Dale has brought out a new battery which, I think, will suit your purpose. It also promises to supersede the Bunsen for the electric light. I shall try it, and report results shortly.

INCANDESCENT LAMP. (*Rainhard*).—This correspondent desires information and illustrations of a new incandescent lamp discovered by Dr. Regnard, in which air mixed with petroleum vapours is made to burn against a cage of platinum. I have as vague an idea as yourself respecting the different parts of this new lamp. Several similar lamps have been brought out since the electric light woke their inventors. Hence we have Clamond's lamp, in which a mixture of gas and air is made to heat a cylinder of lime, and his more recent invention in which magnesium wire is made to burn in a cage of platinum by similar means. Then we have Lewis' incandescent gas-light, in which a mixture of gas and air is forced upon a gauge of platinum, and made to heat it to an incandescent condition. Platinum wires can be had of Mr. Dale in any size, from 2s. per dwt., but I deem the manufacture and working of those lamps to be outside the province of an amateur. Clamond's lamp is described and illustrated in the "English Mechanic" for August 11, page 514.

POLITZER writes in reply to SUFFERER'S query in Part II of AMATEUR WORK, ILLUSTRATED:—"There is no such thing as a self-acting battery; what he requires is an Electro Medical Coil. To the coil a *battery* cell or cells is connected—in fact, the battery is to the coil what a boiler is to a steam-engine. I have a very good coil with four different powers, which I can sell, complete, with handles and battery, for 30s., or I will furnish full instructions how to make a coil that shall cost no more than five or six shillings, or instructions how to make the larger and more powerful one."

Cure for Sciatica.

W. H. (*Dewsbury*) writes,—If SUFFERER will write to the Superintendent of the Public Baths, *Dewsbury*, he can be furnished with plain instructions and complete galvanic apparatus for the self-treatment and cure of his complaint, Sciatica.

Electro-Plating.

T. A. C. (*Stafford*).—We have no book at present on "Electro-Plating," but Mr. Edwinson's articles on this subject in AMATEUR WORK, ILLUSTRATED, will put you in possession of all information you require on this subject.

Telephones.

P. R. D. (*Fakenham*).—Messrs H. & E. J. Dale, or Messrs. J. & W. E. Archbutt, who both advertise in this magazine, will supply you with magnets, wires, etc. For a few stamps they will send you their illustrated catalogues, which, besides giving prices, etc., contain a good deal of information.

Photographic Studio.

E. W. K. B. (*Green Lanes, N.*)—The probable cost of a photographic studio, 18 feet by 8 feet, and 14 feet high, would be about £22 10s. The dimensions, however, that are named are far in excess of what is absolutely required, and are more suitable for a greenhouse. The calculation of the quantity of glass required is a very easy matter. We cannot undertake to work out arithmetical calculations of this nature for our readers

Model Engines, etc.

DRAPER.—Papers on Brazing and Soldering will appear in Vol. II. of this Magazine. The first of the series is given in this Part. Instructions for French Polishing have already been given.

Attachment of Velvet.

F. J. P. (*Leytonstone*).—For attaching velvet or cloth to wood, use moderately thin glue and spread it thinly and evenly on the surface of the wood. If too much is used it will make its way through the covering material.

Portable Sets of Tools.

C. W. H. P. (*Weston-super-Mare*).—I am sorry you consider the prices of these tools exorbitant. You must recollect that they are not ordinary tools, but tools made expressly for this special purpose, and that the leather case, which is well made, is included in the price. The panel of which you speak in the "Lily Mirror" is evidently intended to be quadrupled.

Fiddle-Making.

G. R. R. (*West Calder*).—You will find that pure alcohol will readily dissolve asphalte.

J. V. (*Dublin*).—You are to be congratulated on your success, which it is gratifying to learn, you attribute to AMATEUR WORK, ILLUSTRATED. In the present volume a Supplement will be given with Working Drawings of every part of a full-sized violin.

ARCHIMEDES.—You can get your gums of the merchant named in a late issue of AMATEUR WORK, ILLUSTRATED. Any yellow gum (say gamboge) or saffron, may be used for the yellow sizing.

P. R. D. (*Fakenham*).—English equivalents of French measures are generally given. The reduction however of French to English is a simple arithmetical process, which it would be out of place to describe in these pages.

C. G. (*Clayton*).—Your idea for bending the ribs of a violin by steam and moulds, would certainly be practicable for very rough made violins, but ribs so bent would never last, and would be constantly altering. With handsomely curled wood, even if it were possible to produce the bend, the ribs thus bent would be chronically "cockled" in spite of any amount of scraping. I hope none of my readers who are making violins scientifically will thus disobey their common sense to save themselves a slight extra trouble or expense. Remember that a violin's span of life is more than four times four score years, and we do not wish to make instruments merely to gratify the senses for a decade.

Lathes on the Hire System.

J. J. T. T., in reply to J. H. (*Middle Hulton*), writes to say that lathes are supplied on this system by Goy, *Leadenhall Street, London, E.C.*, on monthly payments not exceeding twelve in number, and that J. H. Makin, *Sheffield*, also supplies them on easy terms. He should send to both for price lists.

THE BRITANNIA COMPANY, *Colchester, Essex*, also write stating that they "are willing to supply lathes on easy terms of payment to all who can give good references or security."

Fret-saw Attachment to Lathe.

C. S. (*Clonmel*).—Send a drawing and description of your "very simple and very cheap fret-sawing attachment to small lathe." The articles on the Construction of Photographic Apparatus will be continued, the next is in type.

Engraving on Brass.

AMATEUR ENGRAVER.—An early opportunity will be taken to give instructions on work of this nature, as well as other branches of metal-working and the ornamentation of metals.

Repairing Kitchen Boiler.

R. S. R. (*Kilkenny*).—Your kitchen boiler forms part, I presume, of your kitchen range. It is made of cast iron, and it is not possible to repair it. The crack will gradually extend further and further, and your best and only remedy is to get an ironmonger to supply you with a new boiler, which he will be able to do without doubt if he can ascertain who is the maker of the range.

Tool Dealers in Manchester and Liverpool.

M. B. can obtain what he wants in Manchester from J. Gleave, *Oldham Street*, who has the special advantage to me that he has for thirty years past warranted every tool I have ever bought from him, or exchanged or made good any and every faulty tool without a sign of objection and with evidently the most perfect good will. Another good dealer is W. R. Keyte, *Deansgate*. In Liverpool, Mathieson & Co., *Church Street*, keep a large selection. No doubt there are many more, but the shops mentioned are those I know as satisfactory.

Graph Composition.

A CORRESPONDENT sends the following recipe:—"Soak best amber gelatine (from any grocer) in water for eight or nine hours until quite soft and slightly sticky, drain the excess of water off, and then melt with a gentle heat. When fully melted add for every pound of gelatine 5 pounds of common thick glycerine and stir well together. If too hard in cold weather, add a little water when melted; and if too soft in very hot weather, heat it until a little of the water is driven off. Wash the writing off with hot water and a sponge."

R. S. (*Nottingham*) sends the following recipe for the information of M. B. (*Southport*).—Steep 2 ounces of Russian glue in 4 ounces of cold water until absorbed, then put it over a fire, and when melted add 8 ounces of glycerine and 5 drops of carbolic acid, mix with Paris whiting until it is of the thickness of cream. Then pour it out and let it set. Do not let it boil when on the fire. For ink, melt a penny packet of Judson's Purple Dye in two tablespoonfuls of hot water.

GEMARST also sends us a recipe for graph composition, which is hereby acknowledged. It is similar in every respect to the preceding receipe sent by R. S. (*Nottingham*), and it is therefore unnecessary to give it.

Lathe-Work.

J. T. T.—I would strongly recommend this querist to purchase "The Metal Turner's Handbook," price 1s., which contains illustrations of twenty-four different lathes. From the particulars of these, J. T. T. would learn much useful information. The lathe-bed sketched would be very satisfactory. It would cost more than a solid cast-iron bed. A plain wooden bed would answer the purpose as well as the one sketched. A 5 inch single speed lathe would probably be preferable. If J. T. T. lives near, let him call at the Polytechnic Institute, *Regent Street*, and see the workshop there.

E. G. HILNER.—Please state what information on polishing you wish. The process and materials are different for various substances.

Wood for Veneering.

T. J. W. (*Bryanston Street, W.*)—Write to, or call upon, Mr. Thos. Syer, jun., 1, *Finsbury Street, Chiswell Street, E.C.* He will, in all probability, be able to supply you with what you want, or, if he cannot, he will put you in the way of getting it. Neither of the firms you mention keep veneering. they only supply wood for fret-cutting. A sketch for a child's cot, ornamented with fret-work, shall be given at some future time.

Harmonium.

E. J. F. (*Dalston*).—Pedals can be attached to a harmonium by making the pedal depress the end of a backfall under the instrument, and so pushing up a sticker connected with the other end in the same way as described for organ-key action. This sticker passes up the back and pushes up the end of a backfall placed over the keys, the other end of the backfall being made to press on the key. Join the two feeders together by a rod and connect that to the blowing handle, and you will then be able to work both feeders at once.

W. H. (*Liverpool*).—There is a very portable harmonium sold by Metzler & Co., which, I think, would suit you. But a compass of 3 octaves is not much use. If that is all you require why not have a flutina, or an accordion, on a stand? Every manufacturer has his own method of making the various parts of an organ.

E. E. B. (*Liverpool*).—If you set out the scale by the rules given in "Amateurs in Council," you will find that the 18th note, and not the octave, is the half size. This method is more direct and easier to set out than that of the author you mention. Different scales must not be used for the same stop, but different stops should vary in their respective scales.

P. W. B. (*Limerick*).—The second and concluding article on the method to be followed in building a harmonium was given in Part 11.

Modelling.

S. C. (*Armagh*).—Devonshire china-clay, or any pure and freely-working clay is suited for modelling. The instructions desired cannot be given in a paragraph. Papers on "Artistic Modelling" are about to appear, in which S. C. will find the information he seeks. You ask me to "explain a little about the lights and shadows, and by what means to see them." Put any plaster cast in a strong light, and you cannot fail to understand what is meant; the lights are those parts of the cast on which the light immediately falls, and which are, therefore, fully illuminated; the shadows are those parts which are not exposed to the quarter from which the light proceeds, and which, being less illuminated, assume a darker hue.

Protection of Houses.

E. H. H. (*Mortlake*).—The writer of the papers on "Electric Bells" will, at some future time, give instructions for the arrangement of wires so as to afford due notice that burglars are at work. Our correspondent asks for "an article on 'House Fortifying' against the burglar and his arts." He further writes:—"Can you tell me any way of making old carpet into simple oilcloth, or suggest any other way of utilising it."

***** With this Part is presented an additional EIGHT PAGE SUPPLEMENT, comprising TITLE PAGE and INDEX to VOLUME I. of AMATEUR WORK, ILLUSTRATED. This has unavoidably compelled the Postponement of Supplement clearing up Arrears of Replies to Correspondents, to Part 13.**

SUN-DIALS AND DIALLING.

By ARTHUR YORKE.

II.—HINTS AND SUGGESTIONS FOR MAKING ORNAMENTAL DIALS.

THE Elizabethan dial shown in Fig. 8, I have sketched from memory only. The original, on the front of an Elizabethan manor-house in Warwickshire, is in very low relief in pargetting-work, that is, in plaster. One of a similar design might very well be carved in stone, but I have introduced it in this place because it appears to me a thing calculated to be effective if simply painted in black on a wall. The outline should be boldly made out, and the little shading necessary, indicated by a few lines only. From association, perhaps, the Elizabethan style seems peculiarly suited to the adornment of sun-dials; and the cartouche form, on which the present example is placed, admits of being varied to infinity.

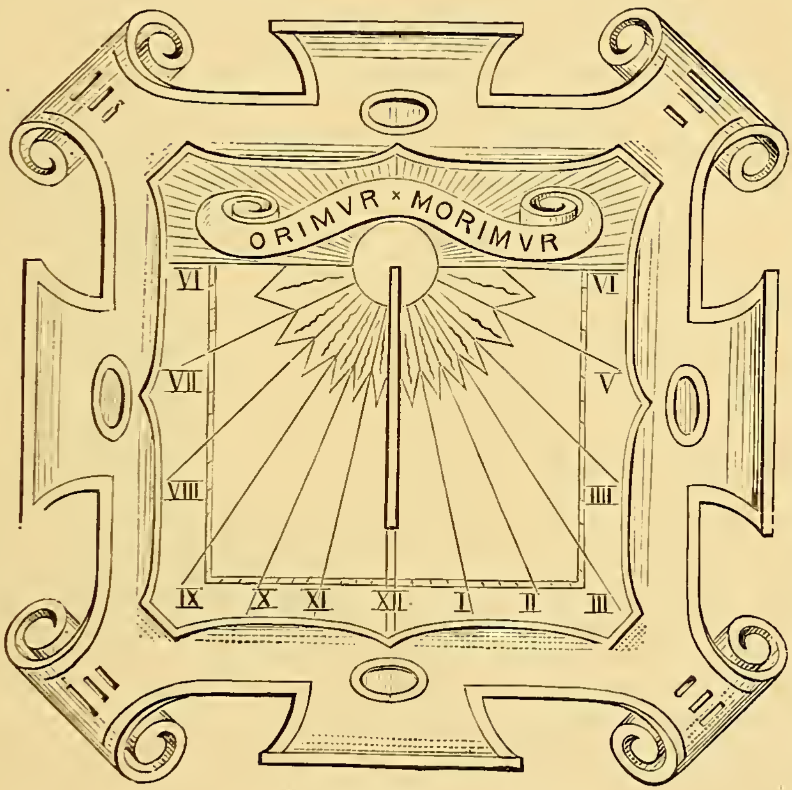


FIG. 8.—ELIZABETHAN SUN-DIAL.
AN EXAMPLE OF AN ORNAMENTAL SOUTH VERTICAL DIAL.

It will be noticed that this dial bears a motto "*Orimur, Morimur*" (We are born, we die). The application of mottoes to dials is an ancient and praiseworthy practice. Many learned men have puzzled their brains to devise suitable ones. The Latin language has, on account of its terseness, always been the favourite vehicle for these things. Here are a few examples, gathered from old dials. "*Noli confidere nocti*" (Trust not to the night). "*Umbra sumus*" (We are a shadow). "*Lex Dei lux diei*" (The law of God is the light of day). *Vigilate et orate*" (Watch and pray). "*Pereunt et imputantur*" (They pass away and are laid to our account). "*Ultimam time*" (Fear the last hour). "*Fugit irreparabile tempus*" (Irredeemable time flies away). But English has at times been used; as witness that not less humorous than practical motto which said to the loiterer, "Begone about your business." Sometimes, too, a couplet was employed, as in the following quaint and devout example:—

"Yield thou to God thy heart, thy time, thy gold,
The day fast weareth, and the years wax old."

In the case of painting on the actual wall it has been assumed that the aspect has been due south, or at least that the wall has faced one of the cardinal points. This having been satisfactorily ascertained, the plan of the dial can readily be traced and drawn in its place by the aid of plummet and level. But supposing that the wall does not duly face any point, or that its material is not suitable for painting upon; or, even supposing that the diallist prefers to carry on his work in a place where he can pursue it with greater ease and leisure than against the actual wall, he will find various materials suited to form a ground on which he can paint, and he can afterwards fix up his dial with hooks.

As a good, cheap, and enduring substance on which to paint, and one on which any amount of colour and gilding may well be employed, zinc may be mentioned. Whether much gay colour and gold about a dial are in good taste is a question for individual opinion. There are good old examples in favour of such decoration. One might be quoted in which a mediæval ship—an emblem of the course of

time—is made to do service as the base of the dial, its mast is the meridian, and its ropes form the hour-lines. Indeed, if the decorator has a taste for allegory, symbolical matter suited to his subject may be found in abundance. To come to more practical matters, however, it will be advisable to let the colour interfere with the hour-lines as little as possible. If thrown upon dark colour the shadow of the stile is much less easily seen than it should be, and, thus, the original purpose of the dial is sacrificed to mere ornament.

Another good and inexpensive material for painting upon is a slab of slate. Slate may be gritted down to a good, even surface in the same way as freestone, and afterwards still farther smoothed by rubbing with pumice-stone. In fact it is a freestone. It may be treated as such—its face generally left of the natural colour, and lines and numerals incised. In this case, on the dark-coloured ground, gold tells best for picking-out the incisions. For this, as for every other kind of out-door gilding, oil-size must, of course, be used; the lines and letters having previously received a coat of japan-size, and then one of chrome-yellow paint. A dial made of thin material, such as zinc or slate, can readily be packed to any required angle, and one side brought farther forward than the other by fixing a wedge of wood or stone behind it.

If under the same necessity for bringing the dial to face a cardinal point, a slab of stone is used to work upon, the simplest way is to bring it to the required angle by cutting it wedge-shape; but on a block of good stone I imagine that no diallist will care to paint, but will rather incise and black his letters.

Wood, from its liability to warp and decay, can scarcely be called a good material for the diallist. Yet against one of my buildings is a dial painted on a slab of oak which bears the date 1834. It recently came into my possession, and when I fixed it in its present position I found the wood perfectly sound and good. It had been well coated with white-lead paint, which is undoubtedly the best preservative in common use for woodwork exposed to the weather. This dial proves that, in the absence of better materials, a sound piece of oak may be made to serve the purpose of the diallist, with a reasonable prospect that it will at least last for his own lifetime.

The well-balanced arrangement of the south dial makes it easy of being rendered ornamental, but the lop-sided figures of the east and west dials causes them to be much less susceptible of artistic treatment. In Fig. 9, however, I give a suggestion for the ornamentation of an east dial. As an appropriate emblem of day the sunflower is introduced. This design is intended to be illuminated on zinc, in gold and colours.

The most usual and appropriate place for a horizontal dial is upon the top of a pedestal on a lawn, or in a garden. Thus the dial itself cannot be a conspicuous object, however much the pedestal may be so. It is indeed scarcely seen except by those who examine it to learn the time. To make it the subject of elaborate ornamentation would therefore be absurd, and the diallist who has to decide on the material from which to make it, will not have to consider what will best bear decoration, but simply what will practically be the most suitable.

A strong material will be necessary, for the position of a horizontal dial is a trying one, both as regards exposure to accidents and the weather. In spite of warnings to the contrary, garden tools are sure to be rested against or laid upon it. Being within reach of every one, it will now and then have to receive hard knocks. As it will lie perfectly flat, every shower will wet it, and the water which it receives will not readily run off. The vertical dial can be, to some extent sheltered, or, at the worst, will throw off the rain and quickly dry again; not so this. No painted surface could last long under these circumstances, and incised letters in soft stone would after rain hold puddles of water, which would soon tend to destroy the stone. If the diallist wishes his work to stand, he must be careful in his choice.

For these reasons metal is almost always employed, and generally brass. The diallist unaccustomed to work in metals, need not be afraid of this material. If he gets a brass plate and a graver, which latter will cost about sixpence, he will, if used to handling tools, find it quite possible to engrave his dial with sufficient neatness and decision. The task looks much more formidable than it really is. Hard as the metal may seem, it yields to a properly tempered tool. A plate of copper, which is nearly as good for the purpose, he will find much more easy to engrave. A slab of hard, white stone, such as Sicilian marble, will stand well and be uninjured by weather, if the amateur possesses the tools and skill to cut it. More available and practicable, however, is a slab of slate not less than half an inch thick; this is easily to be got, stands weather well, and may readily be incised. In the design for a horizontal dial, Fig. 10, there is nothing that could not easily be engraved by any one on copper or slate.

How far the pedestal can be formed without professional help is more doubtful. Pedestals for dials are most commonly made of stone (in a style more or less following the Italian, see Fig. 13), and comparatively few amateur workers care to touch this material. Many who are perfectly at home in working or carving wood, look with a certain awe at stone, as a material quite beyond their power. I well re-

member having this feeling myself in early life; and when I had once overcome it, I was surprised to find how very much easier it was to carve in soft stone than in wood.

There is nothing in working a pedestal in freestone which need alarm any ingenious person. Unlike wood-carving, stone-carving demands no considerable outlay on tools. I remember, years ago, the man who now stands pre-eminent among English stone-carvers, talking on this subject, said to me, "One can't have too many tools for wood-carving; but as for stone, I can carve it as well with a rusty nail." This, if not literally true, expressed the broad fact correctly. Few and simple instruments will

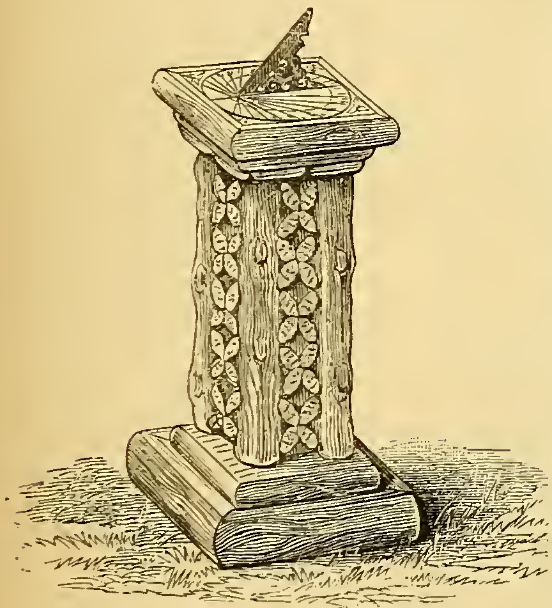


FIG. 11.—RUSTIC PEDESTAL FOR SUN-DIAL.

suffice for soft stone; and if wood tools are used, they will suffer no more injury than may be put right by re-grinding.

When resting on the earth, and still less when partly buried in it, few kinds of soft stone will stand weather well. Indeed, Caen, the best of all soft carving-stones, will not stand anywhere out of doors. In Bath stone, there is one description which bears weather well, but is unfitted for carving, whilst that which is a good carving stone will not bear frost. Among stones in general use, Portland is the only one which at the same time will bear a reasonable amount of exposure, and admit of easy, if not of very elaborate carving. It will be found well suited for the present purpose. Its cost, in London stone-yards, is about 1s. 6d. per cubic foot.

Except in quite a formal garden, a rustic wooden pedestal may be as pleasing to the eye, if less enduring, than one of stone. Merely the stump of a tree, twined round with creepers, will in many situations look well when applied to this purpose. In Fig. 11, I have given a somewhat more elaborate design for a rustic-work pedestal to exercise the skill of the amateur diallist and carpenter. Its construction is explained by the plan, Fig. 12.

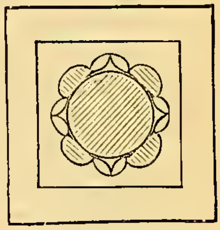


FIG. 12.—PLAN FOR RUSTIC PEDESTAL.

It is formed of one larger length of rough wood, covered with bark—say of 6 or 7 inches diameter—and two smaller lengths, sawn through their centres, and nailed against the sides of the larger. Larch is the wood to be preferred, both for appearance and durability. The base and top are of stout plank, over which are nailed strips of rough wood. The kind of "dog's-tooth" ornament running up the hollows, is formed merely of fir-cones, fastened with brads to the woodwork.

A horizontal dial is, it should be remembered, much more easily seen and consulted if kept well below the eye. It is a frequent mistake to make the pedestals for such dials too lofty. About 3 ft. 6 in. is a good height.

The combination dial (Fig. 13) is not unfrequently to be seen, mounted on an ancient stone shaft, in a country churchyard. With the horizontal, it comprises the north, south, east, and west, vertical dials. The four last certainly tell the time no farther than it is told by the first, but they may be seen more readily; and a dial of this kind derives a certain charm from its completeness. With a cube of hard stone, or oak, its construction need offer no difficulty whatever.

The gnomon of a horizontal dial is much more exposed to injury than

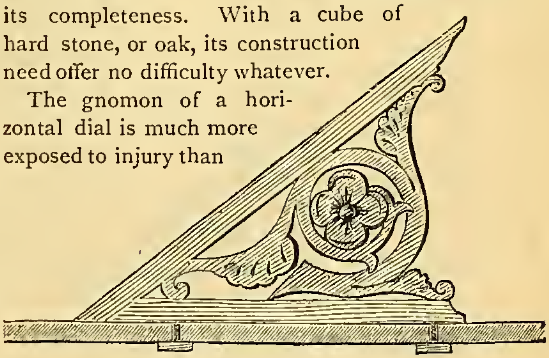


FIG. 14.—ORNAMENTAL GNOMON.

that of a vertical one; and as an unbent and unbroken line in the stile is essential to true time-telling, care must be taken to secure sufficient strength. In the horizontal dial, also, the gnomon is a conspicuous object, and is therefore a fit subject for ornament. Both strength and decoration can be got in cast brass. The diallist can cut a wooden pattern to any

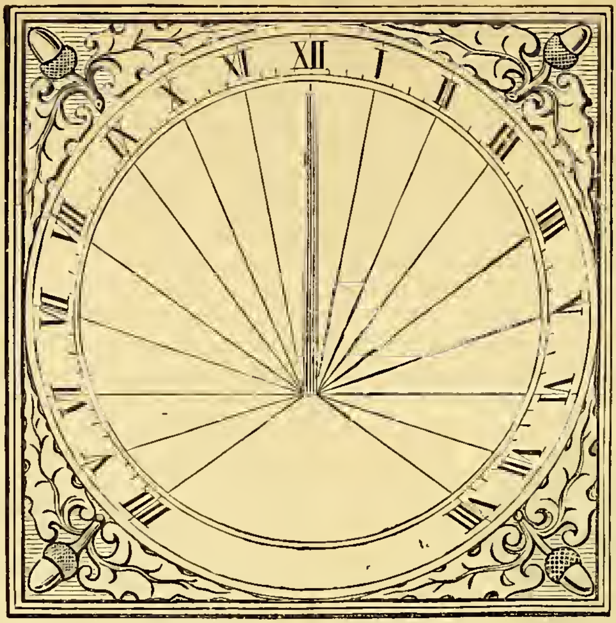


FIG. 10.—DESIGN FOR A HORIZONTAL DIAL.

design that he pleases, and place it in the hands of a brassfounder to be cast. The usual charge for casting brass is about 1od. per pound It must be remembered that the metal shrinks in cooling, and will therefore be somewhat smaller than the pattern. An ornamental gnomon is shown in Fig. 14.

If the situation is a comparatively safe one, whether on a horizontal or vertical dial, a sufficient gnomon may be made of sheet copper, which any amateur can work for himself. A tolerably thick sheet of copper can be cut through with a mallet and chisel, if laid on a lump of lead or a crosscut block of hard wood, and can afterwards be neatly finished with a file.

In fixing dials of all kinds, much care and exactitude are necessary. A horizontal dial requires to be laid perfectly flat, and should be tested with a spirit-level, or, failing such an instrument, with a mason's plummet. That the meridian—*i.e.*, the twelve o'clock line—runs due north and south, may be ascertained by a mariner's compass, or otherwise by setting the dial on a sunny day, with the aid of a correct clock; but before doing so it will be necessary to consult the almanack, and to make due allowance for the difference, if any, between the clock and the sun, on the day when the dial is fixed.

As regards the choice of situations in which to place sun-dials, it scarcely seems necessary to premise that the site should be one on which no trees or buildings can throw shadows which will interfere with the working of the dial. In other respects much will have to depend on circumstances, and on individual taste. I may, however, observe that a horizontal dial, mounted on a carefully or elaborately shaped stone pedestal, never looks so well as when occupying a small bed in the centre of a geometrical flower garden, laid out in formal knots and paths. Such a garden, in fact, never looks complete without its central sun-dial.

In a garden arranged more in natural style, as for instance, where we have an irregularly-shaped lawn, broken upon in places by trees or shrubs, a horizontal dial will look more in keeping if it be mounted on a mere tree-stump, or such a rustic pedestal as the one suggested above. Due regard paid to the fitness of things in such apparently slight matters, goes far towards creating a general effect of good taste.

FIG. 9.—DESIGN FOR ORNAMENTATION OF EAST DIAL.

In fixing upon wall-space for the erection of vertical dials, there are one or two practica considerations which it will be well to bear in mind. In the first

place, it will be desirable to set the dial high enough, that it may be out of harm's way and easily seen. In the second place, to secure, if possible, a wall duly facing one of the cardinal points. If this is not done extra labour will be involved, either in working out the problem of a more elaborate dial, or in the mechanical toil of giving one side of the simple dial the projection necessary to make it face the required point; and in either case the effect, æsthetically considered, will not be so good.

But apart from practical considerations, I own that for my part I rather regard a sun-dial as a thing for the contemplation of myself and my friends than for that of the general public. The days are gone past when the dial regulated the busy affairs of life, and stood in the market-place, and wherever men congregated. In such places it has been superseded by the noisy clock. This old-world monitor seems better fitted now to mark our hours of quiet and retirement. I would rather place a dial where I could see it from my garden or private grounds, than in my street front. Those interested in the sun-dial may feel an interest in knowing something of the antiquity of this time-honoured invention. According to the received Scripture chronology, the dial of Ahaz, mentioned in Isaiah, and which, by the bye, appears to have been divided into degrees not hours, must have been set up about 750 years before Christ. Pliny, however, ascribes the origin of the dial to Anaximander, some 200 years later. In any case, the use of the instrument appears to have travelled, and travelled slowly, from the East to the West.

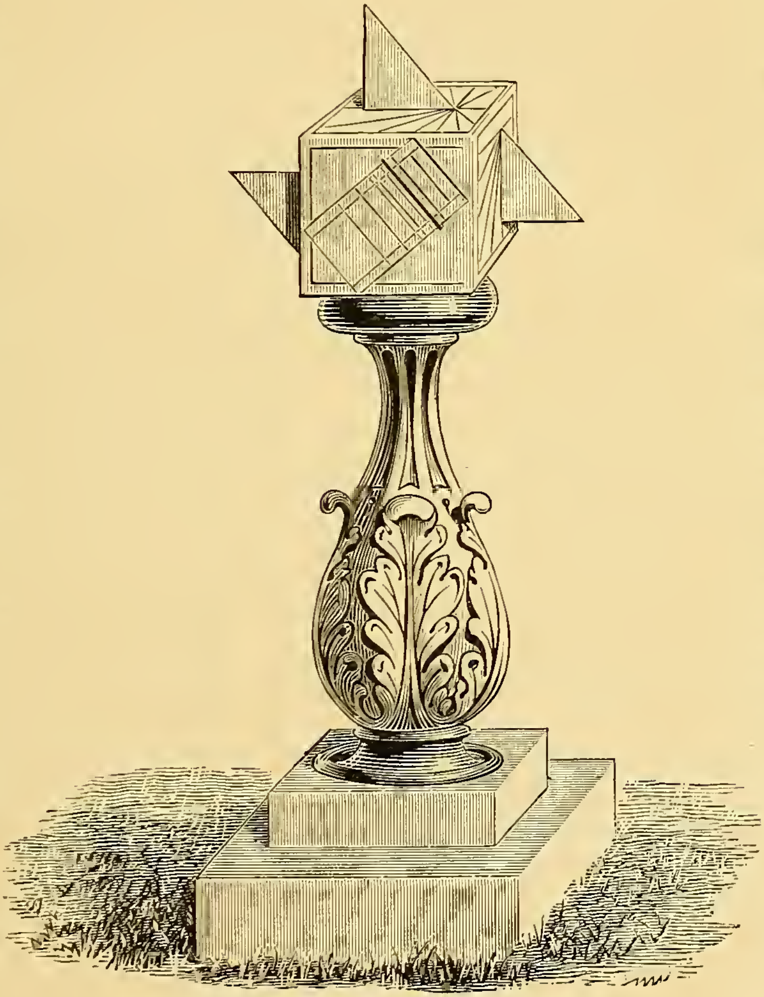


FIG. 13.—DESIGN FOR A COMBINATION DIAL.

The first dial seen in Rome is said to have been set up on the Temple of Quirinus, 293 B.C., at which period the present division of the day into hours was adopted. Somewhat further on, in the days of the Emperors, sun-dials became so much the fashion in the Imperial City that no public building was without one. In the seventh century they began to be used on churches, and thenceforward they were to be seen throughout Christendom in every place where men met or passed, till they were gradually superseded in modern times by clocks.

Perhaps the most startling production in dialling is to be found in our Indian Empire, near Delhi. There we have a horizontal dial, whose gnomon, of solid masonry, measures 118 feet in the stile, and 104 in the sub-stile. The edge of the gnomon, and the graduated circle on which the shadow fell, were ot white marble, which is now much broken. The Rajah Jeysing, who built it about 1710, honoured it with the title of "the Prince of Dials," an appellation which it certainly merited, if size, and size only, be taken into account. And here I must bring my remarks on sun-dials, and the methods of making them and placing them in position, to a close, merely adding that I shall be happy to explain any point which may not be quite clear, through the medium of "Amateurs in Council."

ORNAMENTAL EPERGNE FOR FRET-CUTTING.

By ABBOTT ED. LAKER.

(*For Illustrations, see the Supplement to this Part.*)

BEFORE entering upon a general description of the epergne, a few introductory comments upon fretwork may be made. Fret-cutting is that branch of wood-working which may be undertaken by those who possess only the average capacity of mechanical ingenuity, as tolerably pleasing results may be obtained and useful little articles made with very little practice and at almost a nominal cost compared with their intrinsic value. I am, of course, not speaking of productions of mere children, but of those of a fair age and of mediocre ability. To view fret-cutting as a means of livelihood would be somewhat a precarious, and certainly a fatiguing one, but to those who do it for pleasure there should be this object in view—when selecting a pattern to combine ornamentation with utility. What more gratifying than to be able to inform your friends after having heard your (to them unknown) production spoken of in the most eulogistic manner, that it is your own handiwork? And, further, what an inward satisfaction it must be to know that you have achieved something which, probably very many others have been afraid of attempting.

The amateur must not at first be too aspiring, or he will unquestionably come to grief in his undertaking, and spend his money without being in any degree compensated. First, he should try a small pattern in which there are some bold curves and points, the latter, although very pretty, are difficult to execute properly—that is, to leave a sharp, finished look upon them. A great deal of creditably cut work is rendered unsightly by unqualified "fitting." The general good appearance of an object depends certainly as much, if not more, upon this than the actual fretting; therefore, to insure success, something of a rectilineal nature should be occasionally patronized, wherein right angles are plentiful, because, if a person can fit a right angle properly, he may consider himself competent to undertake the erection of any ordinary article.

Referring to the description of the epergne,—the design offered to my readers is drawn full size, and all the parts are ready for immediate use. The total height is 17½ in. by 13¾ in. diameter of base, *i.e.*, supposing the epergne to be cut out of ¼ in. wood; if thinner, most probably an unsteady base and oscillatory motion would be the result, especially when the arms are in motion. If the amateur, however, wishes for something larger, he has only to decide upon the exact size and enlarge according to scale in the ordinary manner. The amateur must first peruse the construction until he has the result in "his mind's eye," he must then decide as to what kind of wood he is going to use; any hard and clean cutting wood can be selected, but I should advise white holly, chestnut, or sycamore, as these have a delicate appearance, and contrast well with the coloured glasses and flowers. Having chosen the wood, the young fret-cutter must use for his starting point Fig. A, two of which are to be cut, remembering that the slots must be made—one from the top down to centre, other from base up to centre. Care should be taken that these pieces be fitted at right angles in order to admit the segments C. The segments C, upon which glasses containing flowers stand, correspond with plate B, and may be fitted to base by a slight groove being made along the plain line at base, and fastened with glue. This having been successfully accomplished, the next part for attention is the circular plate B, which must be cut in one piece, strict observance being taken to preserve accuracy of the line denoting circular aspect, or the general appearance will be considerably marred. The "turned" piece F is an upright erected upon the circular plate B, and can be secured from *underneath* the plate, one large screw being placed in the centre and small ones round.

If the amateur only possesses the fret-saw appliances he can get this piece turned for a very little cost. Perhaps the arms H had better next be treated with; four of these are fitted into ⅝ in. collars I, which have each a ⅝ in. hole fitting over the perpendicular F, so as to turn thereon; there are two collars to ensure and accelerate an easy rotary movement. The cross-pieces of H, when fitted, form a support for a little glass dish (in which the flowers are placed) 2½ in. by 1⅛ in. deep; these may be obtained at any good earthenware shop. To complete the height of ornament, the hexagon K must be dealt with; before fitting, however, a glass must be obtained, it need not necessarily be hexagonal, only if round or square the number of pieces must be decided upon, and the collars used accordingly. Supposing the amateur to follow the design, he must cut six pieces and connect them at the top by collar L, and at ⅞ in. from, and at the extremity by collars M, one of which has a ¼ in. full hole admitting top of turned piece as far as M; the other is secured by a little spike driven into top of upright passing through it, cut off flush. To preserve a gradual and graceful slope, the pendants D are introduced, and are fitted upon lines marked upon Fig B; these should be arranged to hang midway between the base A, thus relieving the otherwise square appearance; the slots in leaves of pendants are for the reception of birds,

PRESENTED WITH PART XIII. OF

AMATEUR WORK, ILLUSTRATED.

Miniature Sketch, showing (roughly) aspect of Ornament when completed.

"FANCY EPERGNE," FOR FRET CUTTING, DESIGNED BY ABBOTT ED. LAKER.

WARD, LOCK & CO. WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

E, which represent male and female, and should be placed alternately to relieve monotony. Ornaments C are to be placed between pendants, as shown in Fig. B. In conclusion, it rests with the amateur, whether he prefers to fill in details, such as a touch or two of gilt, etc., upon the birds; but he might with all propriety mark the eyes of rabbits and birds in with a fine line, as this greatly adds to the general effect.

PRINTING FOR AMATEURS.

By "A PRACTICAL PRINTER."

I.—INTRODUCTORY.—DESCRIPTION OF THE PROCESSES OF COMPOSING AND PRINTING.

AMATEUR workers are of necessity interested in printing, seeing that our AMATEUR WORK, ILLUSTRATED, could not convey its instructions to its army of willing workers without its aid. In its early days, Satanic power was suggested as the only explanation of the then wonderful fact, that Faust produced numbers of beautifully "*written*" books all *exactly* alike. Now-a-days the cheap press has so diffused light on this (as on every other subject), that all are more or less aware that printed newspapers and books are produced by means of types and a machine called a printing-press. The questions that have appeared from time to time in these pages amply prove that some of its readers are anxious to know more than they do at present of this most interesting art; and the object of these papers will be to convey in the simplest language possible a knowledge of the details of the various materials and processes used in producing printed sheets, which, if intelligently followed, we trust will

> "Make those now print who never did before,
> And those who always printed, print the more."

Before I turn to the "How to do it" part of the business, we would like to remark, that for the most part only two motives seem to impel amateurs typewards; *i.e.*, amusement or pastime, and profit. By this last, we presume, is implied the saving of expenditure for work in this department.

The third, and to my mind the most important factor in the case, is the *educational* value of the occupation. This value arises not so much from the information which is imparted when "setting copy," but from the habits of regularity and order which are imparted while following out the various operations I shall shortly describe. A paragraph from a pamphlet in the writer's possession well puts it thus:—

"The groundwork of a good education consists in a thorough understanding of reading, spelling, punctuation, and the correct use of words and phrases. Not one in ten of those supposed to be well educated can punctuate properly. All these things become 'second nature' to users of type and presses. Habits of industry and neatness are inculcated, and home will become more attractive than ever. A useful art will be acquired, which will at least leave them intellectually better fitted for any position they may afterwards occupy."

To this may be added the certainty that whoever acquires the power to use type and presses has means in his hand which may at any time be of commercial value, now that private printing-presses are finding their way into many business houses.

The various ways in which printing may be made both pleasurable and profitable are described in a little pamphlet, published as an Introduction to the Illustrated Catalogue of the "Simplissimus" Printing Machines, which have been mentioned in the advertising pages of this magazine. Any reader can procure one by enclosing a stamp, with name and address, to the Birmingham Machinists' Company, *Great Queen Street Works*, *Birmingham*. Ask for *full amateur* catalogue.

It will clear the way for the minute details which will soon occupy our attention, if we get a general idea of what is required to be done.

Printing differs from writing, not merely in the shape of the letters (which may be so alike in both cases as to defy detection), but in the mode in which the copies of an original are taken. "Printing" may be defined as "the art of multiplying fac-simile copies of an original." The originals are generally metal types, wood engravings, metal plates engraved, paper writings, dies, and stone.

The materials on which the impressions or copies are taken are various, paper being by far the most generally employed. We purpose confining our attention to what is termed relief printing; *i.e.*, printing from surfaces, which have the lines which are to appear in the printed copies standing higher than the body of the material, which has been cut away or otherwise reduced below the general level. This branch of the art is called typography, and includes printing from wood engravings.

Copperplate work and lithography come under a distinct branch, known as surface printing. In this process the lines which appear and the body are practically all on one plane or surface. In lithography, the lines are formed in greasy ink, on a water-absorbing or retaining surface, which keeps the ink-rollers from inking the white parts; and in plate printing the lines are graven into the metal, or other surface, just enough to retain ink in the lines, when

the entire plate is wiped clear of ink previously deposited evenly over the whole surface. Paper laid on this plate quickly absorbs ink from the slight depressions, the exquisite delicacy of which has given birth to the expression of comparison, "as beautiful as copperplate." The simplest form of printing apparatus is the now common India Rubber Stamp. Almost every one knows what it is, and how to use it; but advanced typographers must pardon me if I stay a moment to illustrate our subject by its means, for the benefit of the novice. The letters and design (reversed) are formed with their faces all in one plane, or on a level, the parts between being sunk below the common level. The stamp is charged with colouring matter, either by pressing the stamp down upon a pad of colour, or by passing an ink-roller across its face. If now the stamp is pressed evenly upon a flat surface, such as a piece of paper, a perfect impression is at once obtained; the design and lettering being not, as in the stamp, reversed, but reading, like this page, from left to right. This fact is important to bear in mind, as it governs everything connected with the arrangement of pages to be printed from.

The simple rubber stamp is a small page of type, just as our amateurs will by and by make up and arrange for themselves in the way we shall describe; but in printing, the operation is not conducted stamp fashion, by pressing the letters first on a pad, and then on paper, but the types are fixed on a flat table, and inked by rollers. The sheet is then pressed upon the types with a powerful and even pressure. The mechanical arrangements for bringing the sheet in contact with the type are such as to insure each sheet being laid in exactly the same position as the preceding one; and this explains how the even margin round properly-printed pages is obtained. The same principle is used in causing many colours on one sheet to fall exactly coincident with each other. Let an amateur attempt to print twice in the same place, so as to show only one impression, or even to print *once*, leaving an even margin all round the printed portion, and he will be convinced of the need for some mechanical means of effecting this apparently simple and important operation; but important it is, and he who keeps this well in mind has gone far towards conquering the little difficulties which lie between common rough and artistic fine printing.

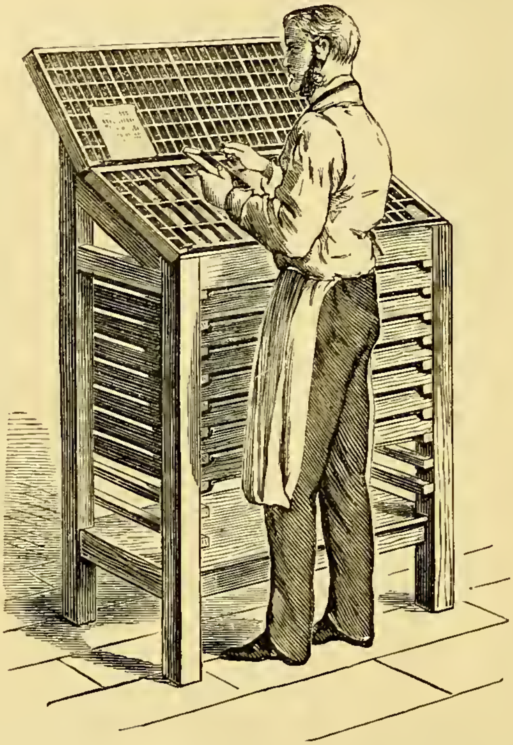


FIG. 1.—COMPOSITOR AT WORK, SHOWING FRAME AND CASES.

We have now to consider how the single tiny metal letters are gathered up and arranged, so as to form a page of letterpress like that your eye now rests upon. Each letter of this page is on a separate little block of metal, nearly an inch long, with the letter on one end of it. These are ranged side by side to make up the words; the spaces between the words are formed by placing a piece of metal, exactly like the letters, only shorter and blank at the end. The long, white spaces at the end of a line, which terminates a paragraph, are also filled up to the end with similar blanks. If more space is required between the lines than is formed by the shanks of the letters, thin slips of lead are placed between each line, till the desired effect is obtained. The thin line at the top and between the columns is formed by a thin strip of brass, so that the two columns are mechanically separated from each other by the vertical brass line. The head-line, "Printing for Amateurs," and the number of page, is also quite distinct from the other letters, the words being picked up letter by letter, and placed above the brass rule line, and the white ends, up to the edges of the other printing, are filled in with the blank spaces.

Having now an idea of what has to be done to prepare a page of type for printing, we must see what arrangements are made for handily manipulating the vast number of tiny metal letters which we have been speaking of. The accompanying engraving (Fig. 1) shows a compositor at work, standing before a frame, with trays of boxes arranged upon it. The trays have as many boxes formed in them as there are letters in the alphabet, stops, figures, etc.; in short, a distinct box is, generally speaking, devoted to holding one particular letter or character. These boxes are not lettered, numbered, or marked, but, by

use, the operator's hand readily goes to the right space as fast as his mind dictates the letters required for the word being formed. I do not stay to consider just now the manner in which the letters are disposed, so as to be most convenient to the hand, as that will be done further on; but reverting to the picture of the "compositor," as he is called, you will observe that his hands are both over the cases or trays of boxes; in the left hand he holds a small frame or tray, which is of a length corresponding to the width of the page or column of type to be set. The little frame is closed in on three sides, and left open on the fourth side; holding this with his thumb inside the frame, he picks up letter by letter, and arranges them in a row along the back of the frame, the thumb holding the line of types in position as it is formed. When line after line has been built up, and the frame is full, it is emptied into another tray, there to wait additions from the small frame, till the page is completed. The next operation consists in fixing the types thus collected in a frame, so that they can be lifted about as easily as a solid mass, and conveyed to the printing-machine, or press, to be printed from. Disregarding, for the time being, the minor details, the types are slid upon a flat surface, and an iron frame, larger than the type by an inch or two all round, is placed over the page; strips and wedges of wood are then put between the sides of the iron and the type, and wedged against each other in such a way that the two sides of the page are tightly pressed toward each other, and the top and bottom are in like manner compressed. If this has been done properly, and the lines are all of the same length, the whole of this page—indeed, the whole side of a large newspaper—becomes so solid, that the frame may be lifted up, and the types struck in the centre with the hand, forcibly, yet the thousands of little types remain solid, as if cast in one piece; and in this shape and condition the page of type is called a "forme," and is ready for press. Should, however, the work described be done carelessly, or improperly, on attempting to lift the "forme," striking it would inevitably result in resolving the whole mass into its constituent elements, or, in the common language of printers, it would fall into "pie"; which condition of type, as well as the amateur's feelings under such circumstances, can be better imagined than described.

It will be understood that the frame and wood wedges are all lower than the type, so that the roller in passing over the type does not ink them, and in like manner the sheet when pressed on the types only takes the impression of everything which stands level with the face of the letters. The forme being taken to the press is laid down upon its bed with the face of the letter upwards. More wooden wedges are used to fix it securely in one position on the machine. This is needful, for it is clear that however perfect the arrangement for laying the sheet always in one place, the effect would be entirely lost if the forme were allowed to move from its first position on the bed. Amateurs who are anxious to try their hands at printing, and wish to make a press for themselves before my instructions for doing so are published, will do well to keep these points in mind, or disappointment will end their labours in disgust instead of going on from strength to strength till they can exhibit specimens of their handiwork, which would not only bear favourable comparison with, but actually surpass, much of the ordinary commercial work of professional printers.

The forme being now fixed on the carriage, or bed of the press, is inked evenly with a hand roller, a sheet is laid on the hinged frame, lowered on the type, and an impression taken.

This impression serves to show if all the letters are in the right position; and now errors of all kinds can be detected and remedied. If wrong letters are discerned, the wedges inside the frame are to be loosened and right ones substituted; all other defects are attended to at this stage, and the types again locked up by the wedges. If now, when impressions are pulled at the press, some letters do not show clearly, pieces of paper are pasted on the hinged flap or frame, just where the faint places occur, and this brings all up to one level, and one colour of ink and general appearance. Thus far there is room for much skill and discretion, and though the printing of the copies is much simpler, yet it must not be conducted carelessly. The inking must be even and not too thickly put on; dust and dirt must be avoided, or the o's and e's will be blind, and the whole smudgy. The amount of pressure, too, must be adjusted, so as to give a full clear face to the printing, and yet not be so heavy as to indent the paper. When the copies are all worked off, the types are washed with a strong ley to remove the ink, and then copiously flooded with water to remove every trace of the alkali. The forme is now carried back to the flat surface, the wedges loosened and the iron frame removed. The lines of type are then spelt back into the boxes in the cases, ready to begin the operation of setting up or composing fresh matter.

The above rapid sketch of the whole process is intended to prepare the beginner by showing him the end and object to be aimed at all through, so that the exact details will not seem unmeaning and unnecessary formalities, but the means to an end, and that end in our case, the acquirement, through love of the pursuit, of that technical skill which every one must possess or acquire who wishes to become an accomplished typographer.

That proficiency in the art of printing may be

arrived at by dint of unaided personal effort, I intend to explain by descriptions and illustrations, wherever needed, all the regular articles used in the trade, and to say where they may be bought, if required. The descriptions will be close enough to enable amateurs to make for themselves any thing they want. Home-made substitutes to meet the demands of the most modest and economical will be considered. The various amateur machines which have been, and are now made and sold, will be described and illustrated, while our own readers shall be supplied with working drawings and descriptions of both cheap and good cylinder and platen presses, although many will doubtless prefer purchasing one of the beautiful modern self-inking presses now made and sold at such a cheap rate. It is a remarkable fact that during the last five years amateur printing has made such advances in England, that two large firms at least are now supplying machinery and material of all kinds freely to acknowledged amateurs, so that the needless obstructionist tactics of the regular typefounders need no longer deter the intending amateur printer from entering the lists of skill with his trade brethren, who used to laugh at his productions, knowing the while that trade sources of supply were closed. If the poor amateur appealed to Mr. Printer to oblige him with a little ink, he was either refused point blank, or else obliged with ink that deterred him from pursuing the subject further. If a few letters were required, the old worn-out founts of the office were placed at his disposal by our jealous friend, who could then triumphantly exhibit his proofs from newest faces, and challenge any amateur to do the same with impunity. Now all is changed, and the advertising pages of AMATEUR WORK, ILLUSTRATED, contain the business announcements of the firms referred to.

In my next paper I will describe regular metal and wood letters as sold; and I will further show how to make substitutes at home with simple tools and easily-procured materials.

(*To be continued.*)

VIOLIN-MAKING: AS IT WAS, AND IS.

By E. HERON-ALLEN.

XI.—THE BOW: ITS HISTORY AND ORIGIN.

IT has been justly remarked that the history of the violin is in point of fact the history of the bow, and this is indeed the case, for without the bow the fiddle (properly so called) cannot exist. Without it the fiddle would cease to express every human emotion, would cease to produce the continuous flow of melody that this instrument alone of all stringed instruments is capable of producing, and would, in fact, without this magic wand at whose touch the marvellous powers of the fiddle are called into being, "become as the sounding guitar and tinkling banjo," and cease to merit the charming comparison drawn in Macheath's song in Gay's "Beggar's Opera:"

> "When the heart of a man is depressed with care,
> The mist is dispelled when a woman appears;
> Like the notes of a fiddle she sweetly, sweetly
> Raises his spirits and charms his ears."

At the same time if it is difficult to trace the progressive history of the violin, it is infinitely more so to trace that of the bow, and for very obvious reasons for if paintings and sculptures of the present day artists do not pay much attention to the execution of so (apparently) subordinate a part of the subject (as is evidenced by pictures and sculptures of our own day, in which though often the representation of the fiddle is accurate, yet "the fiddlestick" is a very different concern from the bow of everyday use), how much less, therefore, are the representations of past centuries to be depended upon.

As to who invented the bow this is not the place to discuss; the invention of the bow being, in fact, the origin of the violin, and already discussed under that head in Chapter I. Of course we cannot take as gospel the absolute testimony of P. B. Zaccharia Jevo, who in his *Musico Testore*, published at Milan in 1706, asserts, "*Safo poetessa invento l' arco de crini di cavallo, e fù la prima che lo suonase come si costuma oggidi.*" It is most probable, however, that the orientals were the first to use the bow, as seen in its primitive form (Figs. 111, 112), which has continued among them even to the present day; as they were, in the opinion of M. Fetis set forth further on, the first to improve it by the addition of the nut. As to when and where the actual word "bow," or its foreign equivalent, was first used, opinions have differed, though it seems to me absolutely obvious that it is identical with the Latin *arcus* =bow, but some ingenious etymologists have tried to derive it from the Greek αρχι=dominion, from the dominion which it exercises over the violin, which seems to me to be, at any rate, very far fetched. As to its actual invention as the accessory, and in fact motive power of the violin, the value of pictorial representations may be proved by a glance at Figs. 76—110, which represent bows only, taken from the most reliable sources, from pictures, sculptures, etc., of every century, from the eighth to the sixteenth. The first thing that will strike you will be the great similarity which exists between all of them, from the first to the last, and also the close parallel which may be drawn between any one of them and the primitive modern bows represented in Figs. 111, 112, which show

two bows now in use among the Moors and the primitive Indians, which are indeed the most simple and obvious form in which the bow could exist. The conclusion we are brought to is consequently this: either, all representations of bows which have come down to us are unreliable, or, the bow instead of developing as the fiddle undoubtedly did, remained in a state of primitive simplicity, and bore the same relation to its companion the fiddle, as do the early specimens of delf ware to the exquisite Sèvres specimens, which recline side by side in the cabinet of the delightfully incongruous nineteenth century drawing-room. If you ask me to which of these conclusions I incline, I think the two deductions are to one another as three times two are to twice three, and that a combination of the two would probably account for the present misty aspect of the past history of the bow. Let us, however, dissect these figures and discuss in detail the extent (if any) to which they are reliable.

Fig. 76 is from Rühlmann's *Geschichte der Bogeninstrumente*, who quotes it from Herbé's *Costumes Francais;* Fig. 77 is from the Abbot Gerbert's, *De Cantu et Musica Sacra*, and is taken from the MS. of St. Blasius. It will be observed that this shows a very respectable form, as does also Fig. 78, which is reproduced from Strutt's *Manners and Customs of the English People*, from the cut which forms Fig. 8, Chapter I. of these series of articles (Vol. I., p. 72). Figs. 79, 80, and 82 are crwth bows, the two former from a MS. at Neuberg, and the latter from the MS. from St. Martial de Limoges, and forms part of Fig. 2 (Vol. I., p. 72). Fig. 81 is from an enamelled plate, dug up at Soissons, which bears two females playing bow instruments—one of them having a bow almost identical with the ravanastron bow, represented in Fig. 112, and the other having the bow here represented. Fig. 83 is from the crwth player, represented in Fig. 3 (Vol. I., p. 72), Fig. 84 from a sculpture in the Cathedral of St. Denis, and Fig. 85 from Strutt in his work before referred to, are again, a very considerable advance in point of shape. There is a figure of Neptune on a capital in a MS. at Douai, holding a bow, which is absolutely and identically the same as that represented at Fig. 84. Fig. 86 is also from a sculpture at St. Denis, and its similarity to Fig. 83 will be at once remarked.

In the bows of the thirteenth century (Figs. 87—99) we find another stride towards perfection. Fig. 87 is from a sculpture in the Cathedral of Rouen, and Fig. 90 from a picture by Cimabue, in the gallery of the Pitti Palace at Florence, being almost perfect. Fig. 88 is again rather elementary by comparison, and Fig. 89 from a figu e of a Jongleur, given by M. Vidal, reminds us very much of Fig. 78, Strutt's Anglo-Saxon bow. In Figs. 91—98 we get more improvements and more retrogressions. Fig. 91 is from a MS., reproduced by M. de Coussemaker, Fig. 92 from a sculpture in Potier's *Monuments Francais*, Fig. 93 from a picture by D'Agincourt, Figs. 94, 95 are from Ely Cathedral, and in them there is too much want of detail for them to be historically valuable to any great extent. We are indebted to Strutt again in his *Liber Regalis*, for Figs. 96, 97, 98, which are somewhat similar, and are again rather a reversion to simplicity than an improvement. In the fifteenth century, the improvements in bow instruments drew with them like improvements in the bow, and though in Figs. 99 and 101, which are from pictures, are elementary, yet Figs. 100 and 102 are most interesting, as showing respectively the violin and double bass bow of the epoch. Fig. 100, the bow of a trumpet marine, is from a MS. in the Monastery of St. Godehard, of Hildesheim; and Fig. 102, we may consider trustworthy, being from a picture by Raphael, in the Vatican. In the sixteenth century, which saw the actual introduction of the violin, and when books began to be written on the instruments then in use, our evidence on the subject of the bow becomes practically certain, though artistic representations of bows of the most elementary description continued to be produced, just as they are now. In Figs. 103 and 104, the latter especially may be considered trustworthy, being from an illustrated work on instrumental music. Figs. 105, 106, and 107, the first and last particularly, may be taken as artistically fanciful. Fig. 106 is from a musical work, but the designator has evidently paid little attention to "so minor a consideration as the fiddlestick." Fig. 108 is from Paul Veronese's well-known picture, the Marriage at Cana of Galilee, and as Paul was himself a viol player, any representation of a musical instrument by him, we may accept as historic. The same remark applies to Fig. 110, which is from a picture by Gerard Dow, in the Dresden Gallery; for Gerard Dow's mother we know played the Viol da Gamba, from her famous portrait by her son. Fig. 109 we may also take as trustworthy, being from Raphael's famous picture of St. Cecilia at Bologna.

After this, the bow as we now have it was practically introduced, and our further representations thereof will be merely progressive, and not including the results of artists' imaginings. With the figures we have before us, it remains therefore, only to separate fancy from fact as near as we can; and this division I think you may safely say will be as follows: Figs. 76, 77, and 78, we must take as they stand, but Fig. 77, it must be remembered, is the work of a priest, reproduced from the work of another priest, and we may therefore consider this figure as about right. In Figs. 79—82, Fig. 81 is about the best form, and most credible,

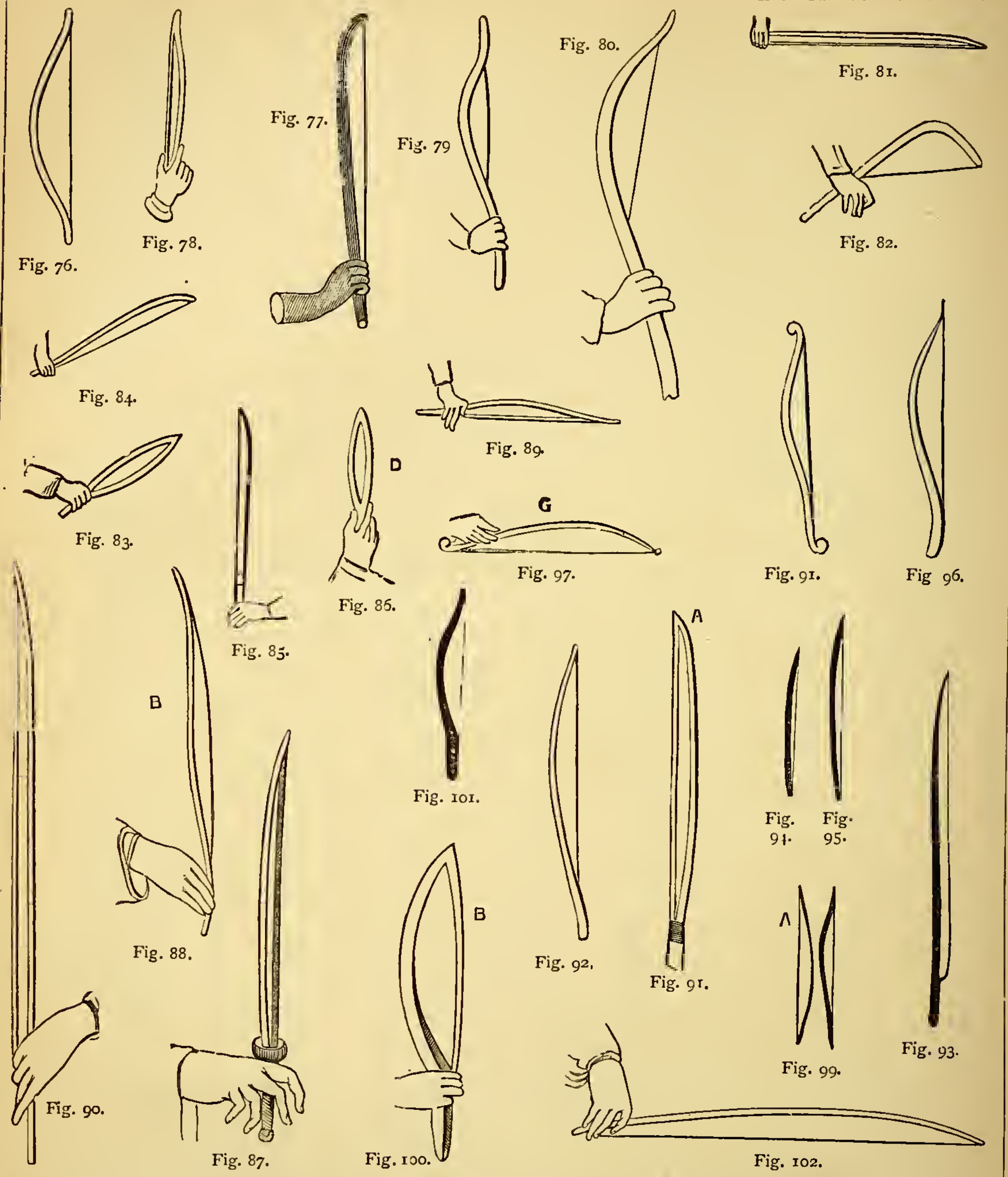
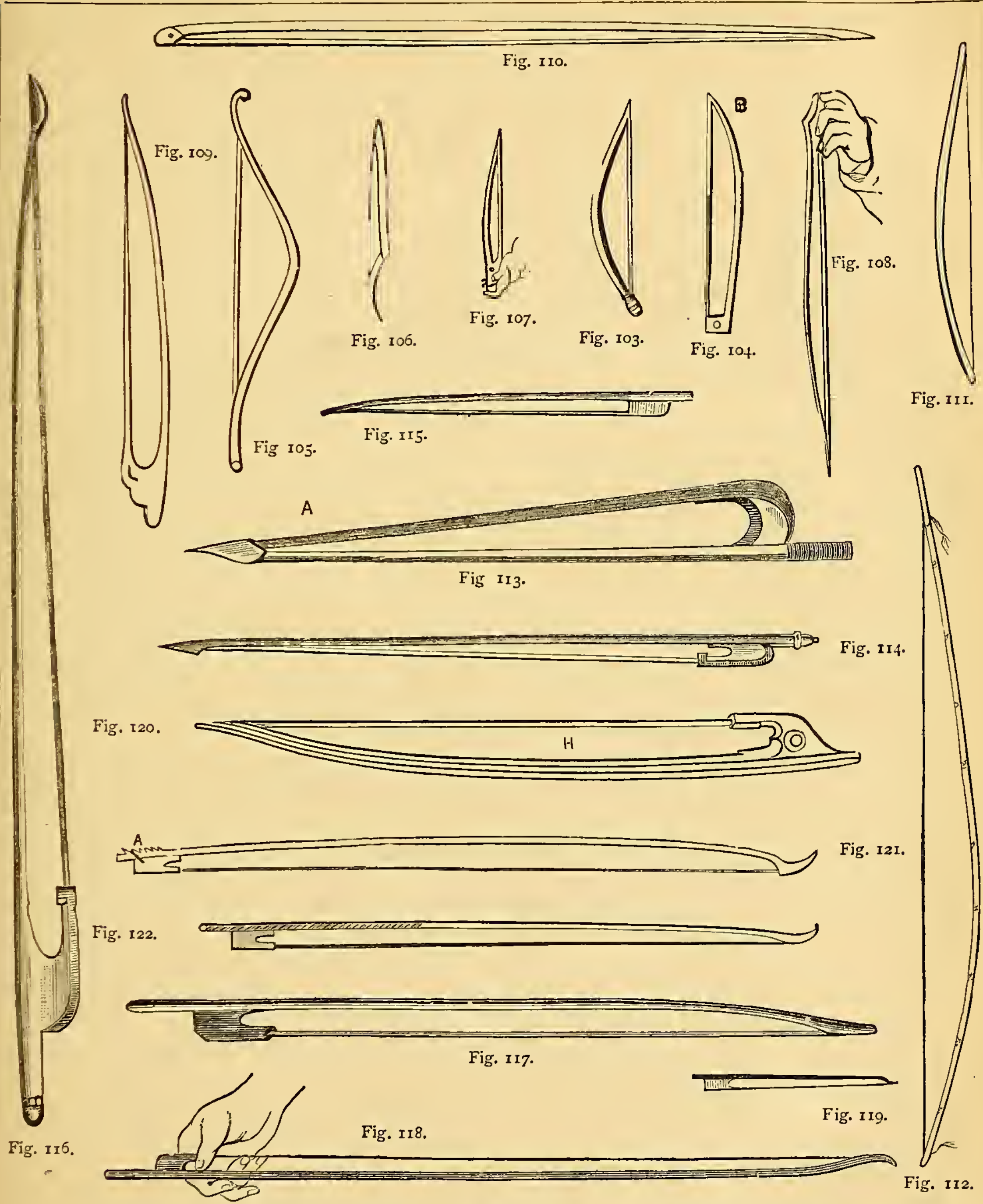


Fig. 76.—Bow of 8th Century (from Herbé's "Costumes Francais"). Fig. 77.—Bow of 9th Century (MS., St. Blasius). Fig. 78.—Bow of 10th Century (Saxon, Strutt). Fig. 79-82.—Bows of the 11th Century (Figs. 79, 80, Crwth Bows from MS. at Neuburg; Fig. 81, from Enamel Plate dug up at Soissons; Fig. 82, Crwth Bow from MS., St. Martial, Limoges). Figs. 83-86.—Bows of the 12th Century (Fig. 83, from Worcester Cathedral; Fig. 84, from St. Denis; Fig. 85, from Strutt; Fig. 86, from Sculpture at St. Denis). Figs. 87-90.—Bows of the 13th Century (Fig. 87, from Sculpture at Cathedral of Rouen; Fig. 88, from Italian Painting; Fig. 89, from Vidal; Fig. 90, from Pitti Palace, Florence). Figs. 91-98.—Bows of the 14th Century (Fig. 91, from MS., De Coussemaker; Fig. 92, from Sculpture, Potier; Fig. 93, from a Picture, D'Agincourt; Fig. 94, from "Liber Regalis," Strutt; Fig. 95, from Cologne Cathedral; Fig. 96, from MS. at Ghent; Figs. 97, 98, from Ely Cathedral). Figs. 99-102.—Bows of 15th Century (Fig. 99, from Picture by Hemleroy; Fig. 100, from MS., St. Godehard, Hildesheim, Trumpet Marine; Fig. 101, from Sculpture, Potier; Fig. 102, from Painting by Raphael at the Vatican.



Figs. 103-110.—Bows of the 16th Century (Figs. 103, 104, from "Musica Instrumentalis," M. Agricola, 1545; Fig. 105, from MS.. Potier; Fig. 106, from "De Harmonia, Mus. Inst.," Gafurius; Fig. 107, from MS.; Fig. 108, from Painting, "Marriage at Cana," by Paul Veronese; Fig. 109, from Painting of St. Cecilia, by Raphael at Bologna; Fig. 110, from Painting, by Gerard Dow, at Dresden). Fig. 111.—Moorish Rebec. Fig. 112.—Indian Ravanastron. Figs. 113 120. Bows of the 17th Century (Figs. 113-116, from "Traite d'Harmonie Universelle," M. Merseunus, 1627; Figs. 117, 118, from "The Division Viol," C. Simpson, 1667; Figs. 119, 120, from "Theatrum Instrumentorium," M. Pratorius, 1620). Fig. 121.—Bow of 18th Century, showing Cremaillere. Fig. 122.—Bow by Tourte.

Fig. 79 being a more elementary form, probably actually in use among the lower classs of fiddlers; Fig. 81 is from a well designed work of art, and is therefore most likely to be copied from existing specimens. In the same way Fig. 78 gives probably a correct idea of the bow used by the peasants and lower classes. It is probable that up to comparatively recently the bows used with the rebecs, or lower bow instruments, continued to be hardly more than arcs, as depicted by Figs. 111, 112, notwithstanding great improvements in the bow with which the higher classes of viols were played.

In Figs. 83—86, Figs. 83 and 86 are probably artistic representations of a bow, nearly related to our double bass bow; one side being probably represented flat, indeed, some authors have figured Fig. 86 almost identically as our contrabass bow, but I cannot say for certain, as I have never noticed the original at St. Denis. Figs. 84 and 85 may be taken as approximately correct delineations of the viol bow; Figs. 83 and 86 being probably for the greater viols and trumpet marine. In Figs. 87—90, Fig. 88 is artistically elementary, but Figs. 87, 89, and 90 especially may be considered faithful representations. In Figs. 91—98, Figs. 91, 93, 94, 95 represent the actual, and Figs. 92, 96, 97, 98 the fanciful element. Figs. 96 and 98 are, however, probably *near* the actual *gross-geig* bow. In Figs. 99—102, Figs. 99 and 101 representing fiction, Figs. 100 and 102 may be said to represent fact, in the case of the double bass and viol bows of the period. In Figs. 103—110 we reach certain evidence, Figs. 105, 106, and 107 being the last relics (as far as we are concerned) of that artistic imagination which always has, and always will stand in the way of the antiquary who searches after truth. And so by progressive stages we are brought to Figs. 113—120, the last point in the history of the bow. These are all absolutely faithful diagrams of the existing bows from contemporary and reliable authors.

It is now that we see the nut minutely delineated for the first time, though it must not be supposed that it was a recent introduction. It is difficult to say where the nut was first introduced. M. Fetis is of opinion that it owes its origin to the east, and cites as evidence in his *Antoine Stradivari*, an Arabian MS. of the time of the first Caliphs, which depicts a bow with a fixed nut. He quotes also, a bow of his own, made of cherry-wood at Bagdad, with a properly constructed head, and nut to receive the hair, the latter fitting into a notch in the stick.

The nut we see is in Figs. 113—120 in all cases, fixed, B represents perhaps the most ornate bow of the century, and Figs. 117 and 118 are most interesting as coming from an instruction book for the Viol da Gamba,* Fig. 118, which shows the holding of the bow is of the actual size of the picture from which Fig. 14 (Vol. I. p. 73) is reduced. Fig. 119 brings us apparently very near the modern bow, but is too small to be very useful as a representation. Fig. 120 introduces us again to the contrabass bow, and shows us we were right to accept as reliable Raphael's representation in Fig. 109.

It was in this century also that, it being found necessary to moderate the tightness of the hair, the cremaillere was added to the existing form of bow. This is shown by Fig. 121, and was a strip of notched metal as at A, fixed to the back of the stick. To the movable nut was added a band of metal which could be hitched over any of these notches, and the tension of the bow thereby regulated at will.

We now arrive at the eighteenth century in which to the violins of Stradivari were added the bows of Tourte. It is to this latter, who lived at the commencement of the eighteenth century, when for the first time Corelli and Vivaldi were showing of what the violin was capable, that the invention of the nut worked by a propelling and withdrawing screw is generally attributed; his bows were a great improvement, being better proportioned, and made of lighter wood, not to mention the elegant manner in which he was in the habit of fluting his bows, throughout half, or the whole, of their length. The head was generally long, pointed, and turned back, which gave the bow a very graceful appearance, as in Fig. 122. The nut and head of the screw were generally of ivory.

Mr. Arthur Hill has perhaps the best collection of old bows in England, the bows of old viols are much more scarce, unfortunately, than the viols themselves.

Tourte's eldest son was much inferior to his father as a workman; it is his younger son Francis Tourte whose name connected with a bow is like the name of Stradivari connected with a violin. M. Fetis in his chapter on bows, at the end of his *Antoine Stradivari*, has given a most interesting and valuable account of this king of bow-makers, which as translated by Mr. John Bishop, of Cheltenham, is shortly as follows :—

"Francis Tourte long known by the name of Tourte, junior, was born in Paris in 1747, in St. Margaret's Street, and died in April, 1835, aged 88 years. Intended by his father for the business of a clockmaker he entered when very young into a workshop, neglected every other study and never knew how to read or write. Perhaps he was indebted to the trade which he at first followed for the skill and delicacy of hand which he afterwards displayed in the manufacture of bows. Disgusted with his condition after having passed eight years in the clockmaking workshops, because he did not there meet with sufficient remuneration for his needs, he took to the busi-

* Christopher Simpson. The Division Viol (London), 1667.

ness of his father and brother. At this period the distinguished artists resident in Paris were making progress towards the art of singing on their instruments with the shades of expression of which the great Italian vocalists had given the example ; and they all desired bows which should answer better to the effects which they wished to produce, and which should possess at the same time greater lightness, spring, and elasticity. Francis Tourte made his first essays with wood from the staves of sugar casks, with a view to determine the forms of the bow and to acquire skill in working without making use of expensive materials. He sold these early products of his manufacture for twenty or thirty sous each (ten or fifteen pence). Being an indefatigable investigator and fully sensible of the important action of the bow in the production of the sounds, he subsequently tried all kinds of wood which appeared to him proper to realize his views ; but he was not long in discovering that Fernambuc wood alone would yield the results which he sought to attain, and that it alone combined stiffness with lightness. The period of the first and important discoveries of Tourte extends from 1775 to 1780. Unfortunately, the maritime wars of France and England then presented a serious obstacle to the importation of Fernambuc wood on the continent, and the price of this valuable article used for dyeing rose to five shillings the pound. Fernambuc wood intended for dyeing purposes is exported in billets : that which is richest in colouring matter is likewise the best for the manufacture of bows ; but it is rare to find billets which are straight and only slightly defective, for the wood is nearly always knotty, cracked inside, and crooked in every direction. Sometimes eight or ten tons of Fernambuc wood scarcely present any pieces with a straight grain, and suitable for making good bow sticks. The rarity of this wood at the period here mentioned explains the enormous price which Tourte asked for his bows ; he sold a bow, the nut of which was made of tortoise-shell, the head inlaid with mother-of-pearl, and the mounting of the nut and button of gold, for nearly £12. His best bows mounted in silver with an ebony nut were sold at about £3 3s., and the ordinary unornamented bows fetched about thirty shillings."

Tourte finally fixed the length of the violin bow between 29·134 and 29·528 inches, and the requisite height from the stick of the head and nut, counteracting the weight of the head by the ornamentations in silver, gold, etc., with which the nut of a bow is loaded. Tourte bent his bows by means of heat to the required shape, and it is thus that all bows are shaped and not cut out of a plank the shape which we see them, as many violin players suppose, for the latter would cut the fibres of the wood across instead of preserving them intact throughout the length of the stick as is essential to a good bow. It is most necessary that the stick should be heated right through the inner fibres before being bent, otherwise the inner fibres being unheated would in time cause the outer and heated fibres to resume their normal position. It is inattention to this that causes the rapid deterioration and straightening out of apparently cheap bows.

Tourte paid as much attention to the hairing of his bows as to their sticks ; on this point Fetis says, "He preferred the hair of France because it is larger and stronger than that of other countries." The preparation to which he subjected it consisted in scouring it with soap ; he then put it into bran water, and lastly, after removing the hetrogeneous particles which had adhered to it, he plunged it into pure water lightly coloured with blue. His daughter was almost constantly employed in sorting the hairs, rejecting such of them as were not perfectly cylindrical and equal throughout their length. This is a most delicate and necessary operation, for not more than one-tenth of a given number of hairs are fit for use, the greater portion having one side flat, and presenting numerous inequalities. At the period when Viotti arrived in Paris, the hairs of the bow nearly always clustered together in a round mass which impaired the quality of the sounds. After making his observations on this point, Tourte conceived the possibility of compelling the hairs to preserve the appearance of a ribbon by pinching them at the nut with a ferrule, which he first made of tin, afterwards of silver. He subsequently invented "the slide," *i.e.*, the little plate of mother of pearl which covers the hair on the face of the nut. He did not use quite as many hairs as are now generally put into a bow, the number now, being, as a rule, between 150 and 200. At the end of Fetis' *Antoine Stradivari* (translation by John Bishop, Cocks and Co., 1864), is given a most carefully and scientifically worked out determination of the true working proportions of the Tourte bow, and how they may be obtained.

(*To be continued*)

HOW TO MAKE A SET OF PHOTOGRAPHIC APPARATUS.

By JAMES PARKINSON.

II.—THE CAMERA.

I REGRET my articles on the above have been delayed so long, which has been caused through pressure of business and other unavoidable circumstances, and I hope the delay has not caused my readers any inconvenience. The present paper is devoted to the Camera. Of late years no other scientific apparatus

has undergone such great changes and improvements, as the photographic camera.

On looking back, say, the last few years, the apparatus has changed and improved as much as the process itself, from the great heavy box camera to the present handsome dry-plate camera, described in the following pages. The following is a brief description of a few improvements in photographic apparatus during late years :—

A very unique camera was invented by Mr. Woodbury, which consisted of bellows arrangement. The focus of the lens used being known, the camera is clamped at the desired distance, and the final adjustments are effected by a fine screw adjustment; this camera is very compact, and, when folded, has the appearance of an ordinary sample case.

Then a camera was invented and styled the Jonté dry-plate camera. This was invented with the purpose of dispensing with double dark slides ; the arrangement consisted of camera and changing box combined. The changing box is connected to the bottom of the camera ; the camera is pushed out to the approximate focus of the lens, and is clamped by means of a thumb-screw, then the plates are raised in their respective positions by means of a rack and pinion adjustment ; by these means each plate can be raised from the changing box into the camera, on turning the pinion as mentioned above.

And more recently are the cameras invented and manufactured by Pumphrey and Lawley ; both cameras are invented with the same object as the Jonté dry-plate camera—viz., to dispense with the use of dark slides. The cameras are fixed on tripod stand and focussed, then the plates are fixed in their positions by means of a bellows arrangement, connected with the camera, which enables the operator to work in the inside of the camera without admitting light, and thus perform the necessary operations. These cameras, like the vast numbers of others invented during the last few years, have their advantages and disadvantages. They are very compact and portable ; still I myself would not be bothered with the great amount of manipulation necessary in the field to take each view. I have compared the improvements with my own apparatus, and as yet I have not found one that would induce me to give the old love for the new.

With a camera such as I am about to describe, and half-a-dozen dark slides, all fitting in a tourist knapsack, I do not find any difficulty in walking a distance of twenty miles, the tripod acting as an alpine staff ; and these have done me very good service these present summer holidays, having just returned from a very successful photographic tour, fully satisfied with the design and make of the camera, etc.

I throw out these hints, knowing that many of my brother amateurs will not have the time and constructive skill necessary to construct their own apparatus.

Without making any further remarks upon apparatus, I shall describe the camera we are about to construct. It is essential in every form of camera for tourist use, that it should be as portable as possible, yet combined with strength ; and I would especially bear stress on this one important part—the great mania of the day is to reduce each piece of apparatus to the least possible weight, which will be found not only unsatisfactory to work with, but very expensive in the end. Having made both light and ordinary cameras, I can speak from practical experience, and that is—reject every camera or tripod that is advertised at such marvellously light weights; of course, these instruments are well worth the money asked, but an amateur wants something that will last a lifetime, and give satisfaction to its possessor each time it is used.

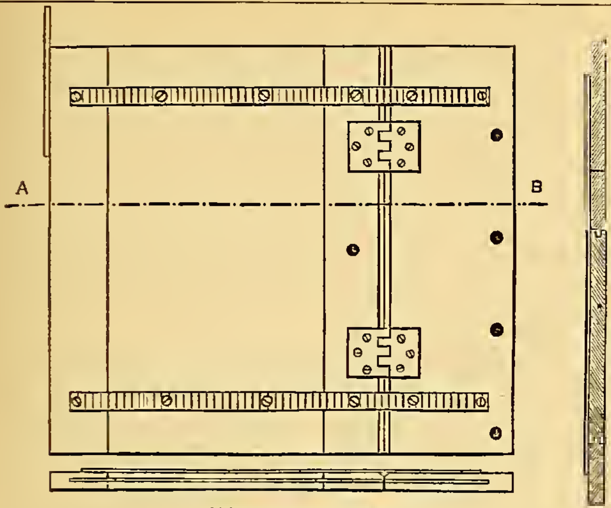
That the back should be capable of swinging from the vertical plane, which is known as swing back; the swing is described as of improved form, which allows the camera to fold up in the same space as one without the swing.

The front, carrying lenses, should be capable of moving in a vertical and horizontal motion, which will be found of invaluable service to the tourist; it should also have folding base and sideboards, with either rack and pinion adjustments, arranged so that pictures may be taken in a vertical and horizontal position.

The camera, as described, may be styled as the most useful, in fact, a perfect camera, containing all the necessary movements and improvements mentioned above, and necessary for all general work, and also arranged to take stereo pictures.

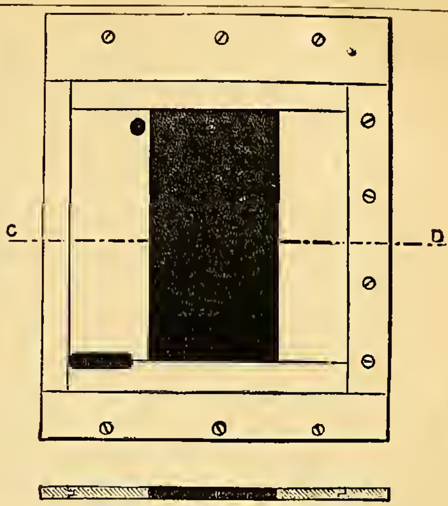
The dark slides, when complete, should be of the following dimensions—$8\frac{1}{4}$ by $5\frac{7}{8}$ inches ; the illustrations are worked out to the greatest nicety from these dimensions, so that any part desired may be calculated up by a $\frac{1}{4}$ inch scale.

The camera may be made of either walnut or mahogany (baywood) ; I much prefer the walnut myself, for two reasons—first, that it makes a much more beautiful finished camera, showing up the different grains of wood, effected by means of clamping, and shows the brass fittings off to greater advantage ; secondly, being very straight grained, it is much easier to work than baywood. If your tools are in first-class condition, all that will be necessary, after planing, will be to use the finest sand-paper, and then it will be in a fit condition to receive the preparations prior to polishing ; with the baywood, it will be necessary to use a fine wood-scraper, and then finish with fine sand-paper.



Side Elevation of Base.

FIG. 11.—BASE OF CAMERA.



Section on line C D.

FIG. 12.—FRONT OF CAMERA FOR VERTICAL SLIDE.

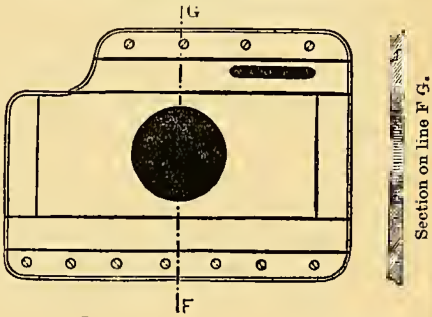


FIG. 13. FRONT OF CAMERA FOR HORIZONTAL SLIDE.

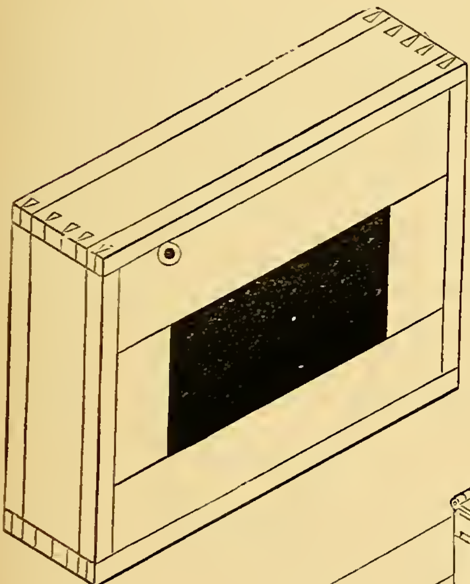


FIG. 14. FRAME FORMING BODY OF CAMERA.

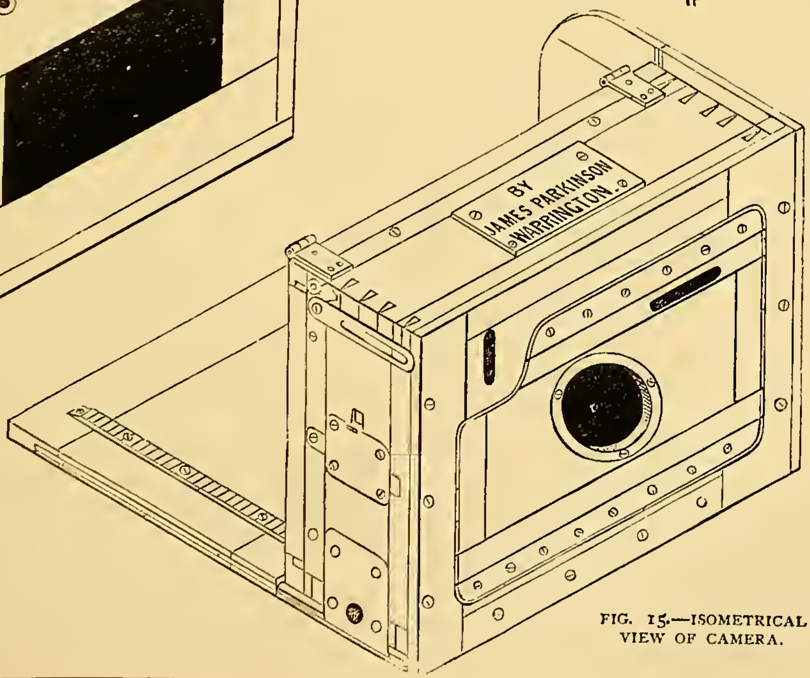


FIG. 15.—ISOMETRICAL VIEW OF CAMERA.

The walnut may be purchased at any respectable timber merchant's. I find the best place to get baywood is at the coach-builders, as you are always sure of it being thoroughly seasoned; but in either case take great care it is perfectly sound and seasoned.

Procure a moderate sized plank of either American walnut or baywood, as decided upon, $\frac{3}{8}$ inch thick, the walnut will cost about 8d. per sq. foot, and the baywood 7d. per sq. foot. Do not buy spare pieces, as by doing so you get several classes of timber, and you will be much more satisfied with your work when complete, than if made from bits.

Assuming that the wood has been procured, and all tools in thorough working order, we will commence work with the body of camera, which is represented by Fig. 14 ($\frac{1}{4}$ scale, that is to say, on a scale of 3 inches to the foot). This, when complete, should measure $8\frac{5}{8}$ by $6\frac{7}{8}$ by $2\frac{1}{4}$ inches, the top and two side-pieces are of $\frac{3}{8}$ inch timber, the bottom piece $\frac{1}{2}$ inch.

This is made the full width and sawn afterwards, as indicated by the lines shown in the illustration; it will be necessary to make the framework about $\frac{1}{2}$ inch wider than required when finished, in order to allow for sawing and planing; it must be dovetailed together as shown. If you are not accustomed to dovetailing, procure a dovetailed box and you will readily see the method, then practise on spare timber till fully competent. When dovetailed and glued, make perfectly square, and put on one side to set, then mark where the saw cuts are to be made; the two outer ones should be $\frac{7}{16}$ inches from each end, and the centre $1\frac{3}{8}$ inches; of course, all dimensions given are when complete. Now measure the length and breadth of timber required for the front frame as shown, which is $\frac{1}{4}$ inch base, tongued and grooved; when perfectly fitted, glue all round, the use of this frame is to attach the front and bellows.

Next comes the base, Fig. 11, $\frac{1}{4}$ scale, which, when complete, should be $9\frac{5}{8}$ by $8\frac{1}{2}$ by $\frac{3}{8}$ in. Reserve the finest grained pieces of timber for the base and front, as those parts are the most prominent in the camera; measure the different lengths and breadths for clamping. The base is constructed of three pieces, top clamp $1\frac{1}{4}$ inches, centre $4\frac{1}{2}$ inches, bottom 4 inches; plane perfectly square, and tongue and groove together—the grain of top and bottom to run crossways, and the centre-piece lengthwise. Tongue top and bottom-pieces. The centre-piece is grooved as shown in the section on line A B; all timbers on the cross should be grooved (not tongued); when tongued and grooved, and perfectly square, glue together; when set clean up, and saw the bottom clamp as shown; in order to hinge, the bottom-piece with screws fixed in should be $2\frac{3}{4}$ inches, and the other $1\frac{1}{4}$inches; the edges must be bevelled as shown by the two outer lines, so that the two pieces will swing on the hinges. Now mark the position of grooves for the racks to fit in, which are $\frac{3}{8}$ inch wide, $\frac{1}{2}$ inch deep, and $\frac{7}{8}$ inch from each edge; next comes the groove, as shown in side elevation of base, which is the same on both sides; this groove is generally made with a circular-saw. Those of my readers who are not the happy possessors of this useful machine, will have to buy a special plane for this purpose; the application of this groove will readily be seen in the isometrical view, Fig. 15. The brass runners, which connect the body of camera to base, slide backwards and forwards as desired.

Next is the front, which is represented by Figs. 12 and 13, $\frac{1}{4}$ scale, Fig 12 showing the front proper with arrangements for the vertical slide, Fig. 13 for horizontal; the dimensions of front, when complete, are $8\frac{7}{8}$ inches by $7\frac{1}{4}$ inches by $\frac{1}{4}$ inch; the two side-pieces with screw holes, Fig. 12, namely vertical runners, are 1 inch and $1\frac{3}{8}$ inches wide, bottom $\frac{7}{8}$ inches wide; the pieces are tongued on the inside, the ends of bottom-piece are grooved to fit in the tongue of the side-pieces; glue and screw down to the frame, Fig. 14.

The centre portion forming the vertical slide, is clamped as shown, with cavity, as shown by the centre portion, running horizontally; this admits the free working of lens, this must be grooved so as to correspond with the tongues of vertical runners.

Fig. 13 shows the horizontal slide, to which the flange of lens is secured (see isometrical view, Fig. 15); the centre portion should be made first, with clamps as shown, the top and bottom rib with screws affixed, are the runners in which the horizontal slide works in; this slide is bevelled all round as represented in Fig. 13 by the double lines. Fig. 15 is an isometrical view, showing the application of the various parts described, with the brass fittings affixed, which will be treated in another paper.

(*To be continued.*)

VELOCIPEDES:

THEIR CONSTRUCTION AND USE.

By A. STEPHENSON.

III.—THE "OVERMAN" AND OTHER MACHINES.—MY OWN TRICYCLES.

AS noted at the end of my last paper, several makers have made a decided departure from the crank and chain wheel methods of propelling tricycles, the aim being to produce machines having an equality of power through the whole stroke, and practically no dead centre—consequently, an increase of power, especially in hill climbing.

The "Overman" or "Victor," is a machine of this

class, and is allowed to be the most powerful tricycle yet produced. It is an American machine, made by the Overman Wheel Company, Hartford, Conn., and called the Victor; the same machine will, I understand, be shortly brought out by the Singer Company, of Coventry. It is an open-front rear-steering tricycle. The driving mechanism consists of two discs—one on the inner side of each driving wheel at the hub, these move freely backwards and forwards on the spindles; they are furnished each with a hook or click, which in the forward motion engages with a slant toothed ratchet wheel fixed to the hub. The discs are put in motion by a steel cord wound round the edge, a groove being made for that purpose, and descending to a pedal lever some 2 feet in length ; these pedal levers have their fulcra in the rear, the pedals on the fore ends, and the cords attached immediately behind the pedals. A downward stroke of a pedal pulls round the disc with its driving wheel, the power to do so being equal during the whole of the stroke, as the pull of the cord is always on the periphery of the disc, and consequently always the same distance removed from the fulcrum, which is the centre of the axle. The backward stroke of the discs is effected by coiled springs within them, sufficiently strong to turn the discs and lift the pedals for a fresh stroke. With this driving arrangement long strokes or short may be taken at pleasure; and as the two driving-wheels are quite free and independent of each other, both strokes may be taken at once, thereby increasing the power immensely, and sending the machine over almost any obstacle. It is, in fact, asserted by a writer who has seen the machine, that it may be driven up a stair ; at any rate, he had seen it driven up several steps. The power in this machine is all forward, it will not back pedal, so in descending hills the driving gear is at rest, and a powerful brake used.

The "Merlin" tricyle, an English make, is propelled somewhat after the same fashion, though the design of the machine is entirely different. It is also an open front rear-steering machine, each wheel is furnished with a disc, or, more properly, a drum of small diameter on the inner side, round which a strap is wound and descends to a pedal lever as in the Overman ; this lever has its fulcrum in front and a pedal on the rear end, immediately under the feet of the rider. A downward thrust of the pedal turns the drum, and with it the driving-wheel, by means of a hook engaging with a slant toothed wheel on the hub, as on the Overman, the back stroke being effected by a coil spring inside the drum. This machine, like the Victor, does not back pedal, so depends entirely on the brake for down hill work. Any length of stroke may be taken, or both together, as in the American machine.

The "Dutton" is another very powerful machine. Its driving mechanism has no resemblance whatever to that of the two above described. It is also a rear-steering machine, but is not open in front, as the main shaft carrying the two driving-wheels is a through one, the rider sitting immediately behind it. The shaft is parted in the centre, and each half has its own driving attachment ; this driving attachment consists of geared wheels, ratchet levers, and foot-pedals, each half of the axle has a small cog-wheel keyed on. A secondary shaft carries two larger cog-wheels which gear with the small ones ; this secondary shaft forms the fulcra of a pair of levers, which extend backwards towards the rider, where they are furnished with pedals ; each lever has a hook near its fulcrum, which engages a ratchet wheel on the side of the larger cog-wheel. A downward stroke turns the larger cog-wheel backward, and being geared with the small wheel on the main axle turns that wheel forward. The proportion of the cog-wheels to each other is such that a full stroke of the pedal propels the machine about two-thirds of a revolution, and full power is obtained throughout the stroke, there being no dead centre. The machine is also fitted with hand levers, which in conjunction with the foot power makes the machine a very powerful one. It is also fitted with mechanism for back pedalling, thereby giving it an advantage in that respect over the Victor and Merlin. The pedals are lifted for a fresh stroke by a cord attached to each and passing over a pulley, the down stroke of one pedal lifting the opposite one. Any length of strokes may be taken, but they must be alternate, a double stroke like the Victor or Merlin cannot be taken.

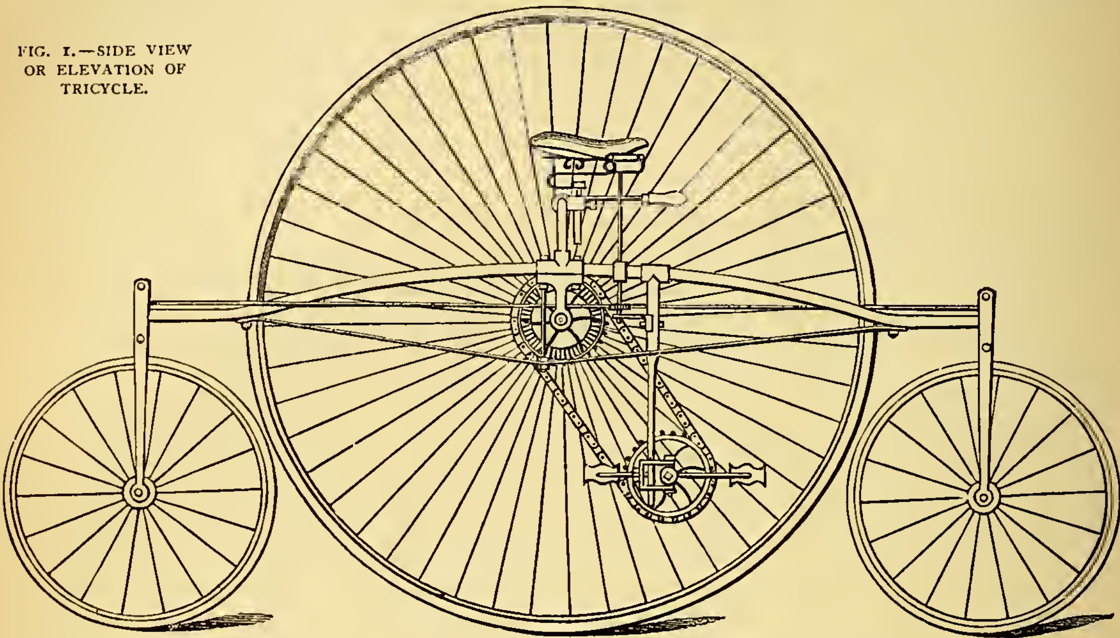
One other machine of this class may be briefly noticed, this is known as the "Omnicycle." Unlike the above three it is a front steerer. The two large wheels are mounted on a long shaft. Two discs, or more properly arcs of circles, are mounted on this shaft. Straps go over them and descend to pedals which run forward, and have their fulcra immediately over the front steering wheel. The peculiarity of the segments or arcs on the shaft is their power of expansion to give increased leverage. They are ingeniously hinged frames, having steel straps which form the arc of a circle, having the axle for its centre. The frames are expanded or contracted by a lever ; the steel arc as it advances to or recedes from the shaft always maintains the arc of a circle, having its centre in the shaft. The smallest size of these arcs is about 4 in. radius, and they may be expanded to about 7 in., thereby greatly increasing the power for hill climbing. The feet of the rider are applied to pedals at the rear end of the levers, and the straps pass up to the segments behind the legs. The back stroke is effected by small gear wheels at the centre of the main shaft between the segments;

the forward motion of the one being the back motion of the other, so that like the Dutton a double stroke cannot be taken, neither does the machine back pedal.

Having now briefly noticed most of the leading machines, we will at once proceed to the construction of our own tricycle. But first of all, what type of machine shall we choose to work upon? Before going further, let me say that I am an amateur mechanic in spare time, and have constructed four tricycles. During the last two years I have experimented a good deal in appliances for driving, most of them to be thrown aside as practical failures, others which I hope to show in some future papers, are far from being failures. My first machine was quite unlike any type of tricycle known to me. It had a double cranked axle with two large wheels going first, these wheels were both drivers and steerers, the steering being effected with two upright side levers turning the frame upon a pivoted joint under the seat, the pedals hung down from the cranks not unlike the "Monarch."

The second was of the Humber pattern, it had a knack of running into the hedge; I dismantled it before I took time to master it. My third was an open front rear-steerer, single-driver, with 44-inch wheels, weight

FIG. I.—SIDE VIEW OR ELEVATION OF TRICYCLE.



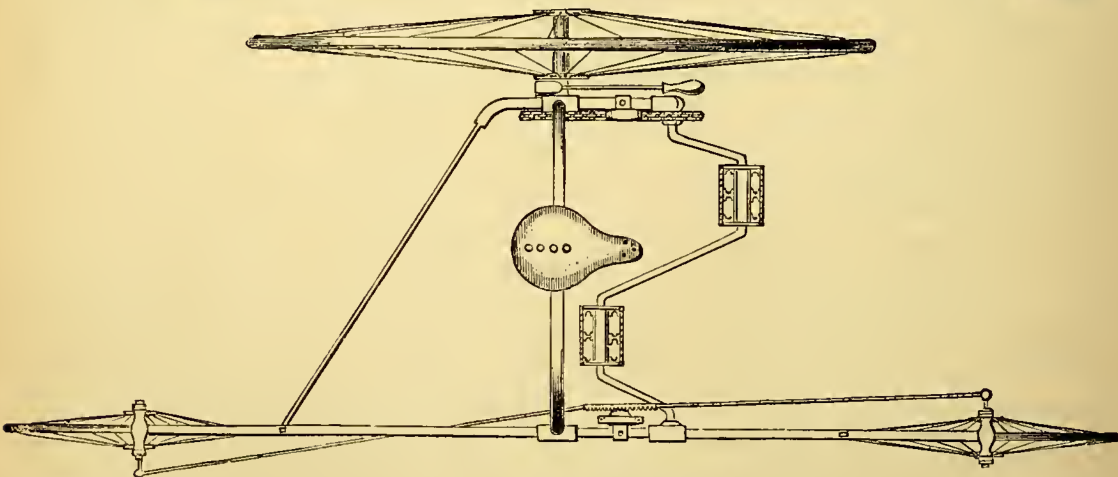


FIG. 3.—PLAN OF TRICYCLE, AS VIEWED FROM ABOVE.

75 pounds, this ran as well as most machines of that type do ; but being far from satisfied with my progress, I set about building No. 4, which I have lately finished. It is of the Coventry Rotary pattern, having a 48-inch wheel on the left side and two 24-inch wheels on the right, which both steer, this being the peculiarity of this type of machine. I have heard the Coventry Rotary highly spoken of, and certainly its merits have not been overrated ; it is a very decided improvement on my rear-steerer, both as to steadiness and ease of propulsion. I have had it out some three times, and though but a novice in riding, I have already mounted hills that tackle experienced bicyclists. This machine steers so steadily that I could run along a couple of 6 inch planks on it.

It is light (75 pounds), simple in construction, safe to drive, and easily stabled. It has but two tracks on the road, and is altogether (so far as my limited experience goes) about the best type of chain-driving rotary tricycle on the road. I shall therefore adopt this pattern as our first job in Amateur tricycle building.

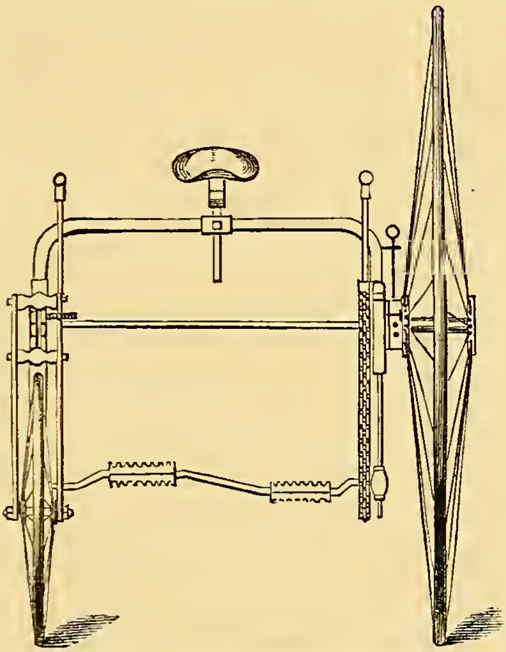


FIG. 2.—FRONT VIEW OR FRONT ELEVATION OF TRICYCLE.

At the outset let me say that although my machine is in principle after the pattern of the Coventry Rotary, no part of it, either in general design or in detail, is the same or copied from the machine of that name made in Coventry.

I will endeavour to describe its construction in minute detail, and exactly as I proceeded with the job, so that if any of the readers of AMATEUR WORK, ILLUSTRATED, of a mechanical turn of mind are disposed to go into the building of their own tricycle, they cannot fail to derive considerable help and guidance from a careful perusal of these papers.

Figs. 1, 2 and 3 are parallel projections of this machine. Fig. 1 side view, Fig. 2 front view, and Fig. 3 the plan from above, from which I think the general design of the machine will be sufficiently clear.

Now as wheels are common to, and the fundamental parts of, all tricycles, we will commence our task with the building of a wheel.

A wheel consists of hub, spokes, and rim, or felloe. The hub is the central part through which the axle passes ; hubs may be bought ready made ; I made my own. It consists of two flanges and a central tube. The pattern for the flanges is turned in a wood-turning lathe, this pattern is a circular disc 4½ inches in diameter. The form of it will be seen from a reference to Fig. 4, which is a section of both flanges and central tube. The pattern is turned with a projection in the centre, 1¼ inch diameter and ⅝ inch long ; on the opposite side it is recessed ⅜ inch deep, leaving a projecting rim ⅜ inch broad, through which the spokes are to pass. The web or body of the pattern is ⅛ inch thick, consequently the edge or rim is ½ inch thick. The flange to the right in Fig. 4 shows two projections. Fig. 5, which is the face of this flange, shows that they are

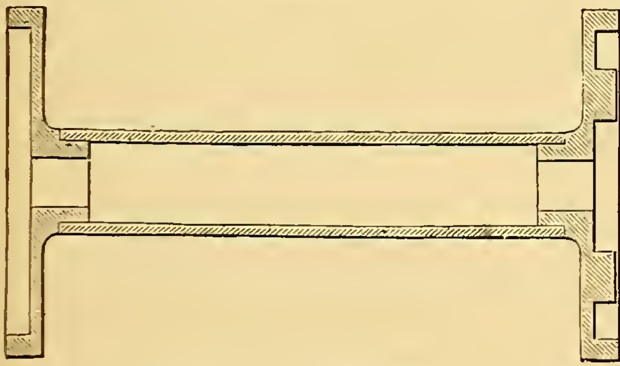


FIG. 4.—SECTION OF HUB OF WHEEL.

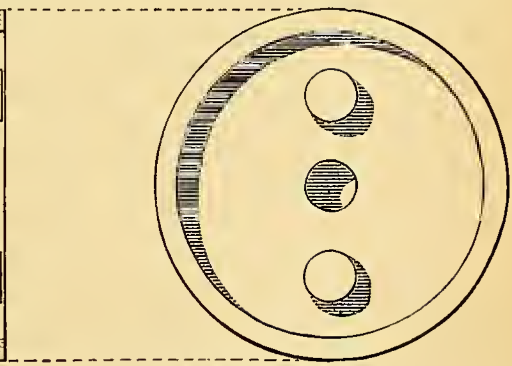


FIG. 5.—FACE OF FLANGE OF HUB.

circular snugs $\frac{3}{4}$ inch diameter, and projecting $\frac{3}{8}$ inch, their use will be shown shortly; these snugs are stuck on to the pattern with short pins. The pattern ready, it is cast in gun metal, one flange with the two snugs, and the other without them. The flanges cast, and the piece of tube 6 inches long and $1\frac{1}{4}$ inch diameter procured, we proceed thus: A piece of wood is turned to fit the tube tightly, when it is mounted in the lathe and the ends turned true, then the flanges are turned on the inner face. A single speed lathe and hand tools may do this job, but it requires some experience. An amateur would find it easier to use a slide-rest. The flange is held in a 3 or 4 jaw chuck, or in its absence a block of hard wood bolted to the face-plate and a recess turned on its face to receive the flange tightly. The exposed face is now turned, as also the central projection, to receive the tube, which should be a good tight fit, and up to a shoulder turned for it (see section Fig. 4). The hole for the axle is now bored, and it is first centered with a graving tool while running. A $\frac{3}{4}$ inch twist drill is now used; it is held with a hand-vice, and its back end having a sunk centre it is put against the centre point in the back headstock and fed to its work with the hand-wheel. It should be fed very slowly, and a good hole is sure to be made. In the absence of a twist drill a common drill may be used and the hole cleaned out with a $\frac{3}{4}$ inch reamer, or with a small side tool in the slide-rest. The other flange is treated in the same way, then both are soldered to the tube with tinman's solder. The hub thus far made is now mounted on a $\frac{3}{4}$ inch mandrel, put in the lathe and turned on the edges and projecting rims at the ends; this may be done readily with hand tools. In the middle of each edge a light cut is made all round with the point of a graver, this is to show the line on which the spoke holes are to be bored. The number of spokes is 48, so each flange is equally divided for 24; care must be taken at this point to make the holes in one flange opposite the centre of the space between the spokes on the other, as when the whole of them reach the rim, or felloe, they are equidistant.

The flanges divided for spokes, a mark is made at each division with a centre punch, then to bore them a drill is used the exact size of the wire spokes, No. 10 W. G. All the holes are drilled towards the centre of the hub, and at an angle with the axis such as will allow the spokes from both flanges to reach the rim without being bent. I bored mine by fitting a block of wood on to the moving cylinder in the headstock, its lower end resting on the lathe bed and its face bevelled off to the angle required; in this face I made two grooves to insert the edges of the flanges, at such a height as brought the part to be bored opposite the drill point, the hub is thus turned in the grooves and all the holes bored to the same angle, and all converging to a point in the centre of the axle hole. These holes are drilled through the projecting rim of a size to allow the wire to pass through as before mentioned. Then a brass rod $\frac{5}{16}$ inch square is drilled with 48 holes smaller than those in the hub and tapped for the spokes, then they are sawn between the holes, thus making 48 cubical nuts, the spokes are screwed for half an inch of their length, and passing through their rim are screwed into these nuts, which lie close in the recess under the projecting rim. I find this to be about the best method of making a wheel with spokes all of one thickness, as when a spoke breaks, the nut with the broken piece drops out, the piece is easily removed and a new spoke inserted; spokes are less liable to break with this method, as none of the screwed part appears above the edge of the flange. The spokes may pass through the nuts $\frac{1}{4}$ inch without any harm, as a thin circular brass plate is fixed on the outer face of the hub with three screws, thus covering in the nuts, spoke ends and the rough recess, as well as the nut on the end of the axle. The spokes are steel, No. 10 W. G. in straight lengths and headed. The rim is crescent steel $\frac{7}{8}$ inch section. Spokes and rims are got from a maker or dealer. The rim has to be divided equally for 48 spokes and drilled. Be it observed that the holes are not in a row in the middle of the section but in a zigzag position, or right and left alternately, and at the same time with sufficient angle to allow the spokes to meet the hub end without bending or straining. After boring, the holes are to be countersunk to receive the heads of the spokes, which should be flush or nearly so, as otherwise they would interfere with the holding of the rubber tyres. Now we have made our hub and drilled the rim, we have now got to cut the spokes the proper length and screw-cut the ends to fit the nuts before mentioned.

In my next paper the first diagram will show how to find the exact length to cut the spokes.

(*To be continued.*)

DECORATIVE CARPENTRY.

FOR THE ARTISTIC AND USEFUL ADORNMENT OF THE INTERIOR OF EVERY HOME.

By J. W. GLEESON-WHITE.

I.—THE ENTRANCE HALL, OR PASSAGE.

IN the series of papers commencing with this chapter, it is proposed:—(1) to suggest to the amateur, various adornments for the house, in accordance with modern taste in art-furnishing, so called; (2) to endeavour to show the most ready and simple way of carrying into practice the hints given, in the least expensive

manner, and that without following any particular style and bound to no strict canons of art, caring little if it be Queen Anne, "Early English," Gothic, Neo-Japanesque, or other high sounding, and as a rule completely misleading title, but keeping designs suitable to the material employed and sufficiently free in their suggestiveness, to allow individual taste and necessity to make use of the idea given, with distinctly personal treatment according to the surroundings and material at the worker's disposal.

As far as possible, it will be well to insist on honest treatment, wood as wood, whether painted or plain, but looking the real thing it is ; and if the cheaper decorative materials are used, to try and use them as they are, and not in imitation of a more costly article.

Perhaps the least confusing way will be to go through an ordinary house, room by room, and note in each part any fresh way of treating a common-place feature, or a fit and useful place to introduce some more novel structure. It will not be assumed, as several sanguine art-writers have done, that each amateur is so fortunate as to possess a lumber-room where stores of old oak, tapestry, and other bygone riches lie waiting discovery, and ready for fresh manipulation ; neither will the methods suggested rest on a special gift for carving and painting, or other skilled workmanship, but, as a rule, be such as the ordinary tool chest, with occasionally the lathe and fret saw brought to bear on the more ornamental features, can in fairly skilful hands work out without outside aid.

For those of the gentler sex who, while wishing to adorn their homes cheaply, but with taste, are able merely to work fret-cutting or decorate with appropriate painting as required, these papers will be of use, as with their suggestions the ordinary village carpenter may be shown what is needed and the way in which to construct the required object.

Beginning, therefore, at the entrance of our typical house, we will not waste words on what may be there, nor meddle with the front door itself—which, with the windows and more structural features of the house, must be left in professional hands—but we will see what can be done to improve this much-neglected part of the home—a part, too, from which every stranger nevertheless gets his first and often lasting impression of the dwelling. This is the only part seen by many callers, it is yet often in otherwise well furnished and tastefully-decorated houses, the most conventional and mean portion of the whole establishment.

The wear and tear of this much-used part suggests as an imperative need some ample protection for the walls, especially in the lower portion ; if it be only a passage from its size, though called by courtesy a "hall," the passing of so many people and packages will soon make the paper shabby, or if painted leave an unpleasant greasy rub. It is always patent that a plain surface, if it takes the wear less, shows it more, as every speck or smear tells out clearly. Nothing could be better here than a wainscot, as it used to be called, or as modern "culture" nicknames it a "dado." Why not spend a very little more money on a wooden structure, than put up with a papered surface, soon shabby, and never satisfactory if repaired, but needing the whole height covered every time the lower part is worn. A wainscot of simple panelling, as suggested in Fig. 1, may be used ; the height and size must be governed by the need of the owner. The old rule of the rail taking the rub of a chair back is a good rough guide to the height wanted ; the panels may be slightly decorated by simple bracket pieces of thin wood fixed at the top, as given in the sketch. A skeleton framework is shown in Fig. 2 ; this could be made of very slight wood (½ inch stuff) put together in the simplest way, as shown in Fig. 3, and fixed to the wall behind the skirting board, which is easily removed and placed in the front, the height of the lower rail should be arranged that the skirting board overlaps it by arms ½ an inch at the top, a chair rail, for which alternative forms of a simple character are given in Fig. 4, finishes the whole. The square spaces at the top, left 8 in. square, may be filled with the papyrotile (No. 300, 4d. each, No. 400, 4½d., both dark, or No. 200, 3½d. blue and white) in its simplest and cheapest patterns ; these, if glued to the wall could be put in place after the framework was fixed, the whole of the wood, and the wall behind in the panel openings being painted in any colour that may be preferred, or the openings showing in place of tiles a paper of rich small all-over pattern, that, guarded by the projecting woodwork, would escape the wear. Most paperhangers have odd pieces of costly papers that they sell very cheaply, and one piece carefully used would suffice for a long passage. The wall space above may remain as usual, either painted or papered. The chair rail to the left in Fig. 4 is of a form which will allow plates or dishes to be placed on it with safety.

If something of a wainscot or dado in the styles suggested is contemplated, out of it and as a part of the design might grow (as it were) a hat or umbrella-stand, the usual cast-iron stand never harmonises with the rest of the furniture, and the ordinary hat-stand is usually one of the ugliest pieces of furniture of the whole dwelling, and, as it always stands rather away from the wall by reason of the skirting board, and is also somewhat tilted forward by the weight on it, its unsightliness is made still more prominent and obtrusive. It will be seen in Fig. 5, that by a simple arrangement of the panelling, four divisions are made a story higher, the chair rail being stopped at each side, and carried on the top of the higher portion,

single brackets (Fig. 6) fixed to the uprights at a convenient height, and connected by a bar of wood or metal, afford space for sticks and umbrellas, while the skirting board is carried out in a box-like form at the foot of the framework and immediately under the rail to contain a tin box that will take the drip of the wet umbrellas.

For such an arrangement as this a separate hanging hat-stand that could be fixed on the wall above, would be most suitable. A design for such a hat-stand, or rather hat-rail, is given in Fig. 7. It is extremely simple as far as the principles involved in its construction are concerned, and this may be said of all the designs that have been brought under the notice of the amateur wood-worker in this paper. The details of the construction are exhibited more plainly and on a larger scale in Fig. 8. First of all two pieces of clean wood, that is to say, wood free from knots and blemishes, are taken to form the uprights. The dimensions of these, as far as width and thickness are concerned, may be 1½ inches square, or 1½ inches for width and 1 inch for thickness. Notches are made in these uprights at suitable distances to receive four rails, about 1½ inches wide and ½ inch thick; or, as is shown in Fig. 8, the rails may be of the same thickness as the uprights, and halved into them in the manner shown in Fig. 3. The lower pair of rails do not extend beyond the outer surfaces or sides of the uprights, but the upper pair of rails are carried beyond them to admit of an additional hat-peg or hat-hook, as shown in Fig. 9, on either side. These upper rails are further connected by shorter uprights, so as to form a framework for the reception of the papyrotiles shown in Fig. 10. These papyrotiles may be glued to the wall, as previously suggested, but it is better to form the framework of the rails than take the hat-pegs with a rebate, like that of a picture frame, into which the papyrotiles may be dropped and fastened It is all very well to glue tiles to the wall of one's own house, but if the wood-worker be living in a house that he rents from another person, it is desirable to provide for removal at any time.

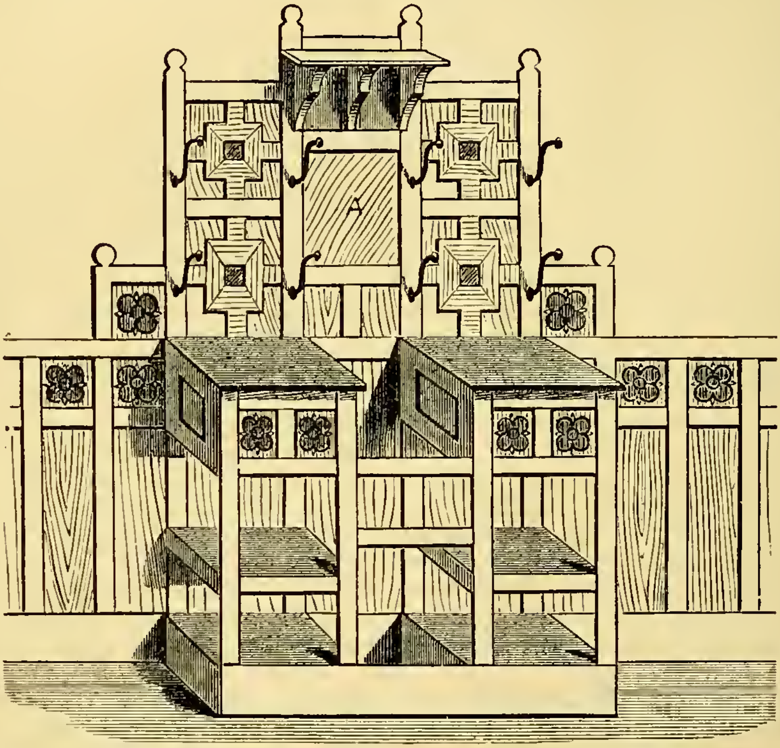


FIG. 11.—DESIGN FOR A HAT AND UMBRELLA STAND, WITH HALL TABLE ATTACHED.

In Fig. 11, another and more elaborate design is given; this includes hat and umbrella-stand with hall table, in one construction, and is in itself, with a chair or other seat, sufficient furniture for a small hall. The details of construction are similar to those of the wainscots or panelling that have been described, and it is only necessary to refer to the projections that form the table or tables, for there are two, as in a sideboard of ordinary construction with the top removed, the compartment for umbrellas being between them. If it be desired to cover the central compartment as well as the outer ones so as to form a larger table, provision for the umbrellas may be easily made on either side of it, and the entire space below the table devoted to shelves for china, etc., placed on the same level throughout, or at different heights as may be desired.

The large central panel, lettered A in the illustration, may be treated in different modes, according to the fancy of the maker. It may be left open, that is to say, without any substance introduced to fill up the square, but this is certainly a waste of opportunity for adding a pleasing bit of decoration that will impart life and character to the whole. The most appropriate filling will be a piece of looking-glass, or a nicely painted plaque, if this be preferred; the mirror is more useful.

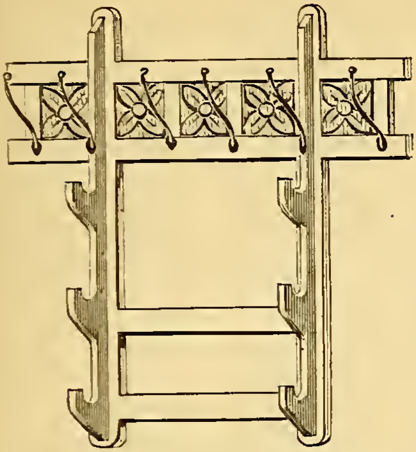


FIG. 7.—HANGING-RACK FOR HATS AND STICKS, TO BE PLACED ABOVE PANELLING SHOWN IN FIG. 2.

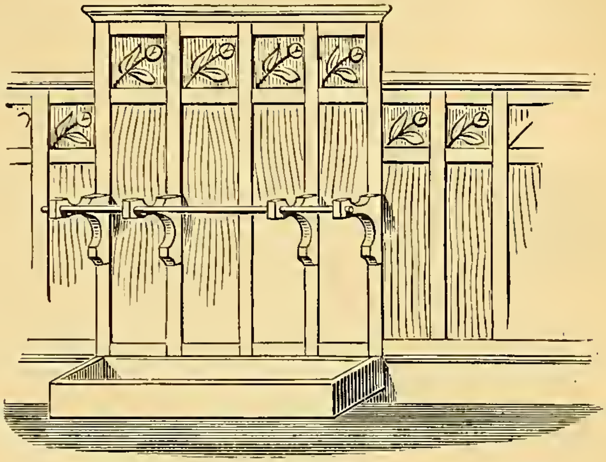


FIG. 5.—ARRANGEMENT OF PANELLING IN FIG. 2, TO ADMIT OF SUITABLE ATTACHMENT OF UMBRELLA STAND.

FIG. 4.—SECTION OF CHAIR RAILS FOR FIG. 2.

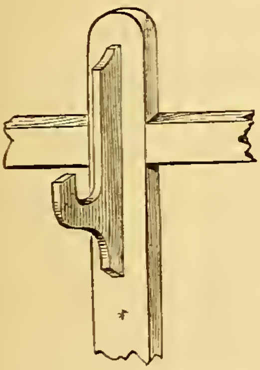


FIG. 8.—DETAIL OF BRACKETS FOR STICKS, ETC., IN FIG. 7.

FIG. 9. — ORDINARY HOOK OF METAL FOR HATS, ETC., AS USED IN FIG. 7.

FIG. 6.—BAR OF WOOD OR METAL TO CARRY RAIL IN FIG. 5.

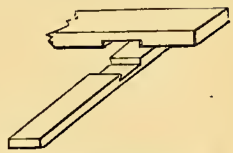


FIG. 3.—CONSTRUCTION OF FRAMEWORK IN FIG. 2.

FIG. 10.—PAPYROTILE, AS USED IN FIG. 7.

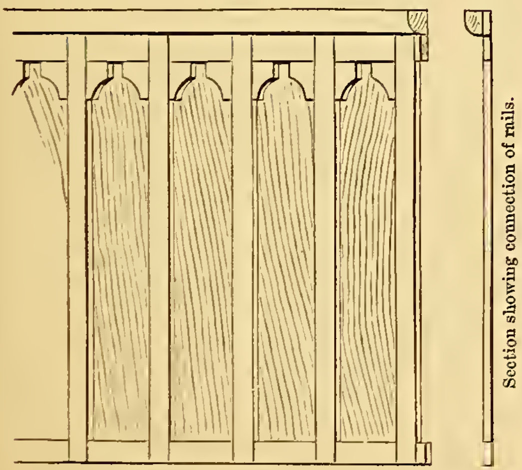


FIG. 1.—SIMPLE PANELLING FOR WAINSCOT IN HALL, WITH CORNER BRACKET-PIECES AT TOP OF PANEL.

FIG. 2.—SKELETON WAINSCOT FOR HALLS AND PASSAGES, SHOWING THREE DIFFERENT METHODS OF TREATING PANELS

ELECTRIC BELLS.

By GEORGE EDWINSON.

VI.—BELL CODE OF SIGNALS.—REPAIRING BELLS AND BATTERIES.—MAKING GALVANOMETER OR CURRENT DETECTOR.

I NOW suppose my readers to have made and fixed some electric bells, and to have spent some little time in transmitting signals from one house to another, or from one room to another. For this purpose preconcerted signals have been agreed upon or invented as required, and these have been found to be irksome and difficult to remember, because constructed without any reference to a definite plan. We may, however, reduce bell signals to a definite system, and use this system or code as a means to carry on conversation at a distance as intelligently as it can be done by a pair of telegraph instruments. In fact, the Morse telegraph code can be easily adopted for use with electric bells of the vibrating or trembling type, and its alphabet, as appended below, easily learnt. The letters of the alphabet are represented by long strokes and short strokes on the bell as here shown :

A . —	J . — — —	S . . .	1 . — — — —
B — . . .	K — . —	T —	2 . . — — —
C — . — .	L . — . .	U . . —	3 . . . — —
D — . .	M — —	V . . . —	4 . . . . —
E .	N — .	W . — —	5 . . . . .
F . . — .	O — — —	X — . . —	6 — . . . .
G — — .	P . — — .	Y — . — —	7 — — . . .
H	Q — — . —	Z — — . .	8 — — — . .
I . .	R . — .	Ch — — — —	9 — — — — .
Ä (æ) . — . —	Ö (œ) — — — .	Ü (ue) . . — —	0 — — — — —

It will be noticed that the strokes to represent a letter, do not in any case exceed four, and that all the figures are represented by five strokes of varying length to each figure. Stops and other marks of punctuation are represented by six strokes, which are in their combination representations of two or three letters respectively as shown below :

Comma (,)	by	A A A	or . — . — . —
Full stop (.)	,,	I I I	,, ...
Interrogation (?)	,,	U D	,, . . — — . .
A hyphen (-)	,,	B A	,, — . . . . —
Apostrophe (')	,,	W G	,, . — — — — .
Inverted commas (")	,,	A F	,, . — . . — .
Parenthesis ( )	,,	K K	,, — . — — . —
Semi-colon (;)	,,	K Ch	,, . — — — — .
Surprise (!)	,,	N Ch	,, — . — — — —
Colon (:)	,,	I Ch	,, . . — — — —

In sending signals to indicate stops, no regard must be had to the letters which they represent, these are only given as aids to memory, and are not to be represented separately on the bell.

Bell signals must be sent with a certain amount of regularity as to time ; indeed, to carry on a conversation in this way it is necessary to be as punctilious in time as when playing a piece of music on a piano, if the signals are to be understood. The dots of the signal should therefore be represented in time by one, and the dashes by two, whilst the spaces between words and figures where a stop does not intervene should be represented by a pause equal to that taken by a person counting three, the space between a word and a stop being of the same duration. To make this more clear, I give an example. The mistress signals to her coachman :

G	E	T		T	H	E		C	A	R
— — .	.	—		—	. . . .	.		— . — .	. —	. — .
2 2 1	1	2	3	2	1 1 1 1	1	3	2 1 2 1	1 2	1 2 1

R	I	A	G	E		R	E	A	D	Y
. — .	. .	. —	— — .	.		. — .	.	. —	— . .	— . — —
1 2 1	1 1	1 2	2 2 1	1	3	1 2 1	1	1 2	2 1 1	2 1 2 2

The coachman replies :

R	E	A	D	Y
. — .	.	. —	— . .	— . — —
1 2 1	1	1 2	2 1 1	2 1 2 2

When the mistress is ready she signals :

B	R	I	N	G		T	H	E	
— . . .	. — .	. .	— .	— — .		—	. . . .	.	
2 1 1 1	1 2 1	1 1	2 1	2 2 1	3	2	1 1 1 1	1	3

C	A	R	R	I	A	G	E
— . — .	. —	. — .	. — .	. .	. —	— — .	.
2 1 2 1	1 2	1 2 1	1 2 1	1 1	1 2	2 2 1	1

And the coachman replies with a single long ring to signify that he understands.

It will be found convenient to have an answering signal from the receiving end of the line to each word separately, this must be sent in the pause after each word, and consists of the short signal E . when the word is understood, or the double short signal I . . when the word is not understood. A negative reply to a question may be given by the signal for N — ., and an affirmative by the signal for Æ . — . — ; other abbreviations may be devised and used where desired. The code having been committed to memory, it will be quite easy to transpose the words and send messages in cypher when we wish to make a confidential communication, or the bells may be muffled under a thick cloak, and thus whilst the measured beats are heard by the person for whom the signal is intended, others outside the room will not be annoyed by them.

Other codes beside the Morse telegraph code may also be pressed into service, and in this way, wherever varying longs and shorts are used to represent an alphabet, conversation may be carried on by means of those bells. I need only mention those of the heliograph ; the flashing signals used in H.M. ships ; and the foghorn signals of the mercantile marine.

Simple pieces of music may also be translated and transmitted by this means, and thus many an evening's amusement provided when days are dull and damp. It will be easily seen that the letters of the alphabet, representing the old notation can be thus transmitted, whilst the time value of the notes may be indicated by **T** for a semibreve, **H** for a crochet, **S** for a quaver, and **I** for a semiquaver, and the bars by the usual pauses. The spring switch, Fig. 72,* or the tapper key, Fig. 63, shown in my last paper, in page 519, Vol. I., will be found useful in sending such signals.

Electric bell systems are liable to get out of order from a failure of one or more of their parts to perform their duties aright. I will therefore indicate a few faults likely to cause a cessation of signals, and give directions for their repair. When a bell ceases to ring on pressing the signal stud, first examine all binding screws for looseness and corrosion, if these are all right, next examine the battery, and test its current. If you, or any of your friends, happen to have a galvanometer or a current-detector, you may easily find out and locate the fault. Begin at the battery. Disconnect the line wires and connect the two terminals of the battery by short wires to the studs or binding screws of the detector. If the needle fails to move, or only moves faintly, examine further as follows: Take out the zinc rods and examine them, if they are black and badly fitted, wash them in water, soak them for a few minutes in a mixture of oil of vitriol one part, to four or five parts of water, then rub quicksilver all over until they are bright with it; if they are only blackened, merely wash them, and proceed to examine the solution in the outer cell. If this has been in work for a few months, and the cell has been standing in a warm dry place, the solution will have shrunk down and crystals will have crept up the sides of the porous cell; wash off these crystals, replace the cell and the zinc, fill up the outer cell to two-thirds or even three-fourths full with rain-water, and test the battery again. If it still fails, examine the lead caps on the carbons and their binding-screws, sometimes the ammonia salts will undermine the lead and interpose a white lead salt between it and the carbon, when this is the case, it will be best to treat the cell as an old one and replace it with a new cell. But it frequently happens that the battery fails to act because the binding screw is dirty or loose, the remedy is then obvious. If the battery has been much in use, or has been short-circuited, or has been set up for months or years, and the zincs are much worn, it will be best to put in new zinc rods, new porous cells, and a fresh solution, thus making it equal to a new battery. The pitch seal of the old cells may be melted, and the charge withdrawn, the cells must then be soaked in dilute muriatic acid for a few days, then in hot water, then dried and used again, but it is not usual to do so, because even after this treatment they are not equal to new cells. The fragments of carbon may be sorted out of the old charge and washed for future use, but the old manganese may be deemed useless to the amateur; the carbon strip will again become useful when fitted with a new head and clean binding-screw. For information in charging the porous cells and making up the battery anew, I must refer my readers to that already published in pages 415, 416, Vol. I. If the galvanometer indicates by the swing of the needle that the battery is all right, we must next examine the bell by the aid of the battery, that is, either bring the bell to the battery, or the battery to the bell, and connect them together, and try to ring the bell on short circuit. It sometimes happens that the iron of the magnet legs, or of the armature is not quite soft, it therefore becomes permanently magnetised and causes the armature to stick; if this is the case, we must stick a bit of gum-label, or a bit of the margin of a postage stamp on the ends of the magnet legs. Perhaps the platinum tips of contact parts are faulty and corroded, perhaps the binding screws are loose and causing bad contact with the wires, perhaps the armature is not properly adjusted. Such faults are easily repaired, but if no faults are discovered at the bell, we must next test the line at its junction with the push or pressel, connect both line wires to one screw at the bell, unscrew the cap or cover of the push, press the end of one of the detector wires on the upper contact piece, and the end of the other detector wire on the lower contact piece, and note the action of the needle. If this acts all right, examine the contact points of the pieces, these are sometimes scamped, that is, either a drop of solder has been put on them, minus the speck of platinum, or no attempt has been made to tip them at all, in this case the brass has become corroded, and this in itself is enough to cause failure. Unscrew the contact pieces, make all good and fasten them in their places again. Instructions for fastening on platinum tips will be found in reply to "Telegraphist," in page 432, Vol. I. When the detector fails to show current at the push, it may be concluded that the line has been cut between the push and the battery, and we must now find the ruptured part, or the line is short-circuited, and we must discover the faulty part. We must therefore follow the course of the wires, carefully examine and test each soldered joint, see that staples have not cut through the insulating material, and examine especially the soldered connection to the earth plate, and

* The engraver, usually very careful and helpful, has made a little mistake in my sketch. The strip of brass, C, should be shown *under* instead of over the strip B, and the knob, D, must be fastened to the strip B, instead of to C, as shown.

the condition of the earth around it, where an "earth" is used. Should a fault be found it must be repaired, and if the line wire has been cut or broken it must be mended, by soldering in a bit of wire of the same size and quality, unless the line is slack enough to admit of its being drawn up for repairs. In any case, the repair of a cut line is a worse task than that of laying a new one, since it necessitates the drawing and tightening of staples, and the re-arrangement of wires along a large portion of the line. If the fault cannot be discovered by the aid of the foregoing hints, the owner of the bell must request the services of a friend who understands the subject, or those of a professional man, to examine the system.

Some workmen test the current in an electric bell circuit by placing the ends of the two line wires or the ends of two wires leading from the line wires on the tip of the tongue, and causing them to make contact in this position. If a current passes, it leaves an acid metallic taste on the tongue, which varies in intensity with the strength of the current. (See p. 449, Vol. I.) Others use the bell as a testing instrument, shifting it from point to point as required, but this plan is unreliable, for the bell may be out of order, it is best therefore to be provided with a galvanometer.

Galvanometers, or measurers of galvanic electricity, are made in various styles, at as many various prices, and for equally various purposes. It is not my intention to describe them here, for a common current detector form will suit our purpose, and such a detector can be bought for £1 1s., or cheaper forms for even a less sum, from Mr. Dale and others. Workmen intending to start in the trade will do well to provide themselves with an instrument costing from £1 5s. to £1 10s. For those who may wish to try their hand at making a galvanometer, I append the following instructions :—

FIG. 75.—END PIECE OF COIL BOBBIN.

FIG. 76.—BODY OF COIL BOBBIN.

FIG. 78.—NEEDLE-GUARD.

FIG. 79.—INSIDE NEEDLE.

FIG. 80.—OUTSIDE NEEDLE.

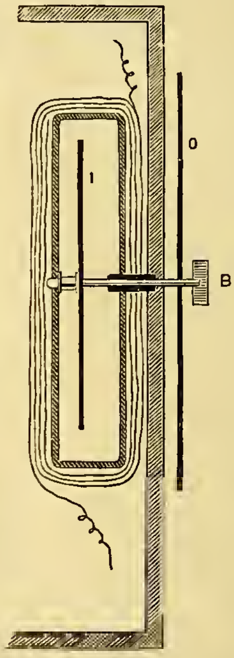


FIG. 77.—SECTION OF COIL BOBBIN IN POSITION.
I. Inside Needle.
O. Outside Needle.
B. Brass Needle-Guard.

Galvanometer or Current Detector.—This instrument owes its action and usefulness to the fact, that a piece of magnetised steel, when free to move, will place itself at right angles to a current of electricity circulating in a conductor near which it is placed. In the form now about to be considered, the piece of magnetised steel is balanced on a spindle, and enclosed in a narrow chamber, around which is wound many turns of fine copper wire insulated with a silk covering. When an electric current passes through the wire thus wound around the chamber, it causes the needle I, Fig. 77, to place itself across the path of the current at an angle proportionate to the strength of the current, and to move an indicating needle O (fixed to the same spindle outside the chamber) in the same proportion. We are thus able to estimate nearly the strength or E. M. F. of the current passing through such an instrument, by noting the deflections of the indicating needle on a graduated arc outside on the face of the instrument.

Such an instrument suitable for detecting the currents in an electric bell circuit may be made up at the cost of a few shillings for material, and by the exercise of a little constructive ability. We shall need, first of all, a magnetised needle, this can be made out of a piece of watch spring. Procure a piece of watch spring 2 inches long, soften it by heating it to redness, and allowing it to cool gradually in a bed of hot ashes, then file it up to the form shown, Fig. 79, drill a small hole in the centre to receive the spindle or pivot, see that the needle is quite straight, then

harden it by heating it again to a bright red and plunging it at once into cold water. It now has to be magnetised; to do this, rub it on a permanent horse-shoe, or other magnet, until it will attract an ordinary sewing needle strongly, or wrap it up in several turns of insulated line wire, and send many jerky charges of electricity from a strong battery through the wire. When it has been well magnetised, mount it on a spindle of fine hard wire, as shown in Fig. 77, and secure it by a drop of solder. We will next turn our attention to the case, bobbin, or chamber, in which the needle has to work. This may be made out of cardboard entirely, or the end-pieces may be made of ivory or ebonite, or it may be made out of thin sheet brass; for our purpose we will choose cardboard. Procure a piece of tough cardboard $4\frac{3}{4}$ inches long by 2 inches wide, double it to the form shown, Fig. 76, and pierce it in exactly opposite sides, and in the centre of those sides with holes for the needle spindle. Now cut another piece of stout stiff cardboard $2\frac{3}{4}$ inches long by $\frac{3}{4}$ inch wide, and cut a slit with a sharp knife to exactly fit the ends of the case or body already prepared; the form is shown, Fig. 75. The spindle holes must now be bushed with short lengths of hard brass or glass bugles, or tubing, made to allow the spindle free movement, and these secured in position by a little melted shellac, sealing wax, or glue. The needle must now be placed in the case, the long end of spindle first, then the short end in its bearing, then, whilst the case with the needle enclosed is held between the finger and thumb of the left hand, we secure the joint with a little glue, or with melted sealing wax. The end-pieces are now to be put on, glued or sealed in position, and set aside to get firm whilst we turn our attention to other parts.

The case, 5 inches by 4 inches, by 2 inches in depth, may be improvised out of an old cigar-box, but is best made of thin mahogany or teak, nicely polished on the outside, and fitted with a cover sliding in a groove, or hinged to form the back of the instrument. The binding screws should be of the pattern known as the telegraph pattern, fitted with nuts—cost about 9d. each. A small brass handle, to be fixed to the top of the instrument (cost about 4d.), will also be handy. A circular piece of smooth cardboard, $3\frac{1}{4}$ inches in diameter, with a graduated arc marked as shown in Fig. 81, will serve the purpose of a dial, and a piece of thin brass bent to the form of Fig. 78 will be required as a needle guard. The face of the dial may be a circular piece of glass held in a brass ogee, or a hole the size of the dial may be cut in a piece of thin wood; this glazed on the inside with a square of glass may be made to form the front of the instrument over the dial. An indicating needle will also be required for an outside needle; this is usually made of watch spring of the form shown (Fig. 80) and nicely blued; but it may be made of brass or any other metal, one made of aluminium being probably the best on account of its lightness; it must be pierced with a hole exactly in the centre so as to balance it as the beam of scales should be balanced, and should one end be heavier than the other it must be filed until they are equal.

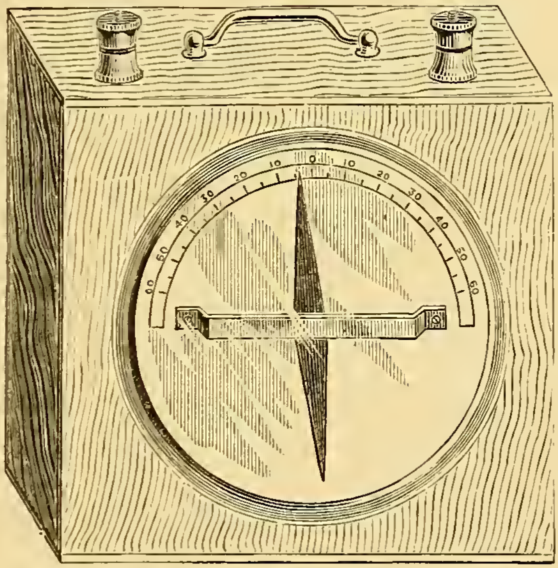


FIG. 81.—FRONT ELEVATION OF CURRENT DETECTOR.

We will now turn our attention to the coil. Procure sixpennyworth of No. 36 silk-covered copper wire and wind three layers of it very evenly on the coil case or bobbin, being careful in passing the needle spindle not to pinch it or throw it out of truth. When this has been wound on, it will be found that one end of the wire points to the left and the other end to the right. These are destined to be connected to the under side of the binding screws shown on the top of Fig. 81. We therefore secure them to their respective sides with a touch of sealing wax, and leave enough wire free at the ends to reach the binding screws—say about 6 inches. It is handy to have an additional coil for testing strong currents, and as this may be combined in one instrument at a trifle additional cost, we will get some line wire (No. 22) and wind six or eight turns of it around the coil outside the other wire: one end of this wire will be attached to an additional binding screw placed between the others, and the other end to left binding screw shown. The coil thus prepared may now be mounted in position. Pierce the card board dial and the wood at its back with a hole large enough for the needle spindle to pass through from

the back to the centre of the dial. See that the thick end of the inside needle hangs downwards, then place the coil in the position it is intended to occupy, and note how far the needle spindle protrudes on the face of the dial. If this is too long, nip off the end and file it up taper and smooth until it will work freely in a hole in the needle guard, with all parts in their proper places. This being satisfactory, secure the coil in its place by sealing wax, or, better still, by two thin straps of brass, held by screws at each end; placed across the coil. Now clean the free ends of the coil wires, insert them under the nuts of the binding screws, fix the indicating needle on the end of the spindle outside, and see that it hangs in a vertical position with the inside needle when the instrument is standing on a level surface. Secure it in this position, screw on the needle guard, fasten on the glass face, and the instrument will be complete.

On connecting the two screws of the long, thin coil with a battery, the needle will be deflected to an angle depending upon the E. M. F. of the current, but when connected with the short, thick coil, only a strong, full current will be indicated, or the quantity of current generated in the cell ; it is therefore usual to mark the studs or screws of the thin coil, or coil of fine wire, with the word INTENSITY, and the stud of the thick coil with the word QUANTITY. A little practice with this instrument on batteries in various conditions will enable its owner to estimate the value of the deflections and compare them with the strength of the batteries. One use of it I must not fail to mention : When a line has been completed it should be tested for leakage. This may be done by placing the detector in circuit with the battery—*i.e.*, one stud of the fine coil must have the line wire attached to it instead of to the battery, and a short wire must lead from the other stud to the battery. If there is a leakage at push, bell, or any other part of the line it will be indicated by a deflection of the needle.

In future papers on this subject I may have something more to say about this instrument, and, if it be desired by my readers, I may also turn my attention to the construction of "Burglar Alarms," "Sluggards Bells," and "Indicators," for cold dark evenings and mornings render those instruments desirable and even necessary in our homes. These subjects, however, will be treated as separate and independent articles, for it will be premised that, from what has been already described in detail, the reader knows how to make all the appliances necessary for causing a bell to ring by the aid of the electric current, and that it will be merely necessary in future papers on the subjects indicated above, to show him how to turn the knowledge he has already acquired to good account under peculiar circumstances.

THE ART OF PAINTING ON THE PHOTOGRAPHIC IMAGE.

By JOSEPH WAKE,
Head Artist to the Autotype Company, London.

II.—TINTING SHADOWS OF FACE AND EYES.

TO produce a finished water-coloured photograph, some such method as the following must be adopted : As regards the face, after having got on your general wash, as before described, take some warm colour and wash over the *darkest* shadows, matching them in shape and size *exactly*, or a very absurd effect will be produced ; if these shadows are very black, as in some photographs, orange chrome will be found an excellent colour used with plenty of gum. The quantity of orange put on must depend upon the kind of photograph, and the good taste of the colourist—just so much as to take away the photographic look, and yet not to look unnaturally bright. Should the print be a delicate one, with faint shadows, Rubens' madder will be found a beautiful colour used with gum for the deepest shadows.

The next *lighter* shadows may be treated with raw umber, a truly wonderful colour, for the way in which it seems to illuminate the dull half-tints of the photograph. Between these medium shadows and the true flesh colour, there ought to come some beautiful pearly greys, but, alas ! in most photographs they are wanting ; and to make anything like a finished looking picture they must be supplied, by being gently stippled on to all retiring parts of the face, across the forehead, between the deep shadow, on the shaded side and the high light, all down the temples and side of cheek in the light side, this last delicately mingled and shaded off into the carnation of the cheek. All round the sockets of the eyes, and especially in ladies and children, a bluish tint will be observed in the corner of the eye next the nose. If you examine a person's face in an ordinary light, you will find it nearly all grey, very little so called "flesh colour" appearing at all. There are a set of flesh greys sold by Messrs. Bernard, of *Oxford Street, London*, which are admirable for this purpose, or they may be made by using different proportions of French ultramarine, light red, and raw sienna. In supplying the deficiencies of an inferior hard black and white photograph, much information may generally be got by consulting the dark side of the face, to make good shortcomings in the light side, for instance, it will often be found that the eyebrow has partially disappeared ; what it was like may be ascertained by looking at the perfect one on the other side, and so on.

In a finished picture I think it is better to put on the first wash without gum, as that (after the shadows are glazed) gives an effect somewhat analogous to the impasto and glazing of oils, besides it hides or tones down the photographic grey a little. The carnations on the cheeks and lips should be delicately stippled on with a little rose madder with a dash of vermilion mixed with it, more vermilion for children than for adults, as a rule; this pink colour should be shaded delicately off towards the ear, and not carried too far up towards the eyes, or it will give a blushing appearance, and, above all things, keep it off the tip of the nose.

The eye is a most important feature, and will well repay studying from nature. If the eye can be got to look life-like and full of thought, it will often hide a multitude of sins in other parts of a picture. A few good drawings of eyes and other features at large, such as are to be found in Vere Forster's handbooks, will be found of great use. I have always before me good casts of ears, hands, feet, etc., the latter are especially useful in children's pictures, who are very frequently taken in a semi-nude condition, showing their feet, which they generally manage to move at the critical moment.

Blue eyes may be well rendered with Prussian blue, properly drawn in and shaded; observe where the speck of light falls, and note that it is generally too large in a photograph, whilst the iris and pupil may generally be made larger with advantage. "Grey" eyes, it will be observed, have generally a bluish rim, and are warmer in the part where the light shines through. Generally yellowish dark brown eyes present the greatest difficulty, as they generally photograph simply as black spots. The best way is to take some orange chrome with gum, and paint it thickly all over the iris and pupil, covering them entirely; then when quite dry, put in the pupil *exactly* in its proper place, then shade up with vandyke brown, leaving the transparent light part opposite where the light strikes the eye light and liquid looking; finally, add the white spark, if visible in the photograph, if not, do not attempt to introduce it, as if not to be seen in the photograph, depend upon it the head was not so lighted when taken, as to make its appearance possible or natural. Be particular to colour the little red muscle visible in the corner of the eye next the nose. When you require very deep touches about the nostrils, corners of mouth, etc., Indian red and vandyke brown may be used, or a little burnt carmine. Keep the space between the upper lip in half-tone, if too white it gives a pout; do not let a deep shadow run round the lobe of the nose, it gives a kind of snarl; keep it soft and quiet.

(*To be continued.*)

HOW TO WARM A SMALL GREENHOUSE OR CONSERVATORY.

By AN "AMATEUR GARDENER."

ALTHOUGH we are now far advanced in autumn, it may not even now be too late to consider how we may be best able to keep this year's plants, or cuttings, till next spring, from the frost and cold of winter.

Having a small greenhouse, or conservatory for plants, etc., the next thing is how can the frost best be kept out, for one night of it will do immense damage. There are two ways—namely, hot air stoves, which either warm air by passing it through them, or radiate heat from gills or plates which form part of the stove, or by hot-water pipes, warmed from a small boiler outside, which being placed round the sides of the greenhouse at a low level, radiate the heat from their surfaces, and as air in the process of warming expands, it becomes lighter than cold air and rises; thus a constant upward current of warm air is maintained.

The hot-water apparatus is much the best if it can be conveniently fixed. As fire has to be kept up all night as well as day in winter, inside the greenhouse there would in all probability be an escape of unconsumed gases, etc., from an open stove, which would be detrimental to the plants; also, there are very few stoves which would last all night without attention, and not be too large for the purpose, and expensive in fuel.

The next question is, what quantity of heating pipe would be required to heat a greenhouse of a given size. First find with a rule the superficial glass surface of the greenhouse, also the cubical contents of the part below the level of the side lights, etc., which is generally enclosed by brick or wood, and then apply the following rules, which will give the quantity of pipe necessary to heat greenhouses, etc., of any description, to any required temperature.

1 foot of pipe surface at an excess temperature of 125° to 130°, will heat $6\frac{1}{3}$ cubic feet of air 30° per minute. 1 square foot of glass in greenhouses will cool $1\frac{1}{3}$ cubic feet of air, as many degrees per minute as the internal temperature exceeds that of the external air; hence, 1 foot of pipe surface may be provided for every 5 feet of glass, where the temperature to be maintained does not exceed 30° above the external air. If the temperature is to be maintained at an excess of 40°, divide the superficial extent of glazing by $3\frac{3}{4}$, if 50°, by 3, and if at 60° above the external air, divide by $2\frac{1}{2}$. A more accurate approximation is, to the whole extent of glazing exposed to the atmosphere, add $\frac{1}{3}$, and multiply the sum by the

number of degrees that the temperature of the house is to be maintained above that of the external air. The product divided by 190 will give the quantity of piping to be provided, estimated in superficial feet; or by 160 for feet run of 4 inch pipe. For the parts not glazed allowance must be made also; 1 foot of 4 inch pipe for every 100 cubic feet of air thus enclosed, added to the quantity required by the glass, will be sufficient for the greenhouse.

One of the best boilers for the small greenhouses, is the "Star Independent Boiler;" this boiler requires no brick setting, which is expensive; but only requires to be sunk, so that the lowest level of the pipes in the greenhouse are above the boiler itself, as shown in the accompanying diagram, in which the method of fixing the boiler, and the arrangement of the flow and return pipes, the cistern, air pipe, etc., within the greenhouse are clearly exhibited—so clearly, indeed, as to require no further reference to the different parts by letters or numbers.

It will be seen from the illustration that the boiler has an extended top feeder, so that it will burn through a night without attention, having an extra store of fuel; also, it costs very little for feeding, as it will burn coal-dust, cinders, etc. The height of one as illustrated, of sufficient capacity to heat 100 feet of 4 inch pipe, is 46 inches, and 12 wide. There is also a good little gas boiler, composed of a wrought and cast-iron casing, with copper tubes inside. This is heated by an atmospheric burner, which by means of a small arrangement at the back carries in air, and mixes it with the gas, thus consuming the oxygen of the air, and giving a small blue flame of intense heat and producing nearly perfect combustion. The smallest size of this boiler will heat 20 feet of 4 inch pipe, at a cost of one farthing per hour. This boiler can be placed inside the greenhouse at a low level, and a pipe taken off the top and turned outside to carry off any unconsumed gases, which are a mere nothing.

Having decided which boiler you will use, let us now pass on to the fixing. Let us in this instance take the "Star." Hot-water pipes generally used, are either 2 inch, 3, or 4 inch internal diameter; a 2 inch pipe having half, and a 3 inch, three-quarters of the heating surface a 4 inch pipe of the same length has. They are cast either in 9 feet or 6 feet lengths, and any shorter length must be cut from one of these. If the greenhouse be on the ground level, a small hole large enough for the boiler to stand in and also allow of reaching the bottom doors to clean out the fire must be sunk so that the top of the boiler (not the feeder) is below the floor level of the greenhouse, or the level of the return pipe, but if it be built at a high level, any convenient position below will do, for the higher the head of water, the better the circulation. This boiler has on it two pipe connections, the one at the top being for the flow pipe, and the lower for the return. From these connections 1 or $1\frac{1}{2}$ inch wrought-iron pipe is generally carried into the greenhouse as it is more convenient than cast, not being large, and connected to the cast pipes by means of cast blank ends, drilled and tapped for the same. These pipes must be laid with a little rise, on the top pipe or flow, all round till it reaches the turning point, where a syphon is fixed to connect it to the return or lower pipe. This return pipe must follow or reach the

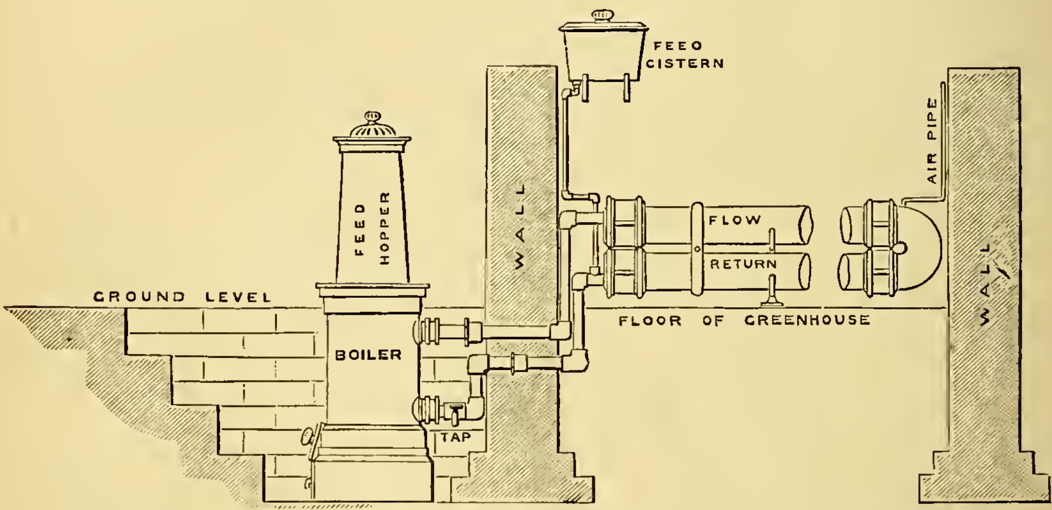


DIAGRAM ILLUSTRATING METHOD OF HEATING GREENHOUSE BY "STAR INDEPENDENT BOILER."

boiler with a slight fall, if it goes back under the flow, as in sketch, it looks best to have the same fall as the flow has rise, and to fall directly before entering the boiler. Either way will work satisfactorily. These pipes have each on one end a socket, and the other end is called a spigot; to make the joint the easiest way is, where there is no great head pressure of water, by india-rubber rings put on the spigot end and jammed into the socket ; the farther the ring is back the better ; then fill up the open space left with Portland cement. Another way is with red lead and yarn, a piece of yarn being put round and caulked with a proper tool to the bottom of the socket, care being taken that the spigot is down as well ; then a small roll of red lead pushed down, and the remaining space filled with yarn, and caulked. This last joint is not so likely to crack and leak with the expansion of the pipe, but is more costly. There are also patent joints which screw together with bolts and nuts, with an india rubber ring inside ; but pipes with these cost about 25 per cent. more than the ordinary pipes. At the highest point of the apparatus, which in this case is the syphon, an air pipe or tap is required to let out any air in the pipes, or steam, if the boiler is over-fired. The pipe, which can be $\frac{1}{4}$ inch lead or iron, is the best, as it requires no attention after being fixed, but a tap would require to be opened once a day. This pipe will be carried up in any convenient place, till it is above the level of the supply cistern, and turned outside. The supply cistern, for supplying water to the pipes, ought to have a ball valve and water supply laid on, but this is not necessary as long as it is kept filled by hand, for as soon as it gets empty by evaporation, drawing off water, etc., the circulation stops, and steam is formed, and here the use of the air pipe instead of the tap would be to let the steam escape. The cistern would be fixed on the staging, or on brackets to the wall, and connected to the return pipe as shown. A plug or tap ought to be put in at the lowest part of the return, to allow for emptying the apparatus when required. The action of the apparatus is this : The fire being in the centre of the boiler, the water has contact all round and heats rapidly, and the fuel only burns till about half way up, as the air can only get in at the bottom, where two doors are placed, one for cleaning the fire bars and the other for air inlet. As fast as it is consumed fresh fuel takes its place by falling down from the feeding hopper on top, which being filled up at night will last till the morning by regulating the damper in the smoke pipe and the air inlet. The water being heated at the bottom of the boiler, expands, and becomes lighter than the cold, and so rises to the top and enters the flow pipe, and passes on to the highest point in the pipes. By this time it has become cooler, the pipes having radiated the heat, and so begins to descend, the return being pushed on by the hotter water behind, and drawn by the vacuum being formed in the boiler by the hot water leaving, and having passed all round the pipes, re-enters the boiler at the lowest level, where the fire is burning the brightest, and so continues its course again.

With the gas boiler the apparatus would be the same, only the boiler would have to be under the level of the pipes in the greenhouse, if placed inside, although outside would do just as well. Gas would have to be laid on to this, which could be done by anyone who has studied the papers on Gasfitting in this Magazine. The pipes would either stand on little carriages and rollers to allow for expansion, or slide on brackets fixed to the floor or walls. If fresh air is admitted to the greenhouse, the best way, and place, is, by means of a sliding grating fixed in the external walls, at the floor level behind the pipes, so that the supply can be regulated, and the entering air become warmed before it reaches the plants. The Star boiler, as here shown, can be purchased for £3 10s., the gas boiler, costing £3, is dearer in proportion, not being able to do so much work, and the tubes being of copper, larger sizes of both are obtainable. The prices of hot-water pipes are about, for 4 inch, 2s. 8d., 3 inch, 2s. 1d., and 2 inch, 1s. 6d. per yard, and the double brackets about 9d. each, but these prices fluctuate with the iron market. Having studied this, if any of its readers propose to warm their greenhouse themselves, I shall be glad to give them any further information they may require, or to help them in any difficulty; the Editor having my address.

ORGAN BUILDING FOR AMATEURS.

By MARK WICKS. from 8 28

II.—WOOD PIPES.

I NOW proceed to describe the process for making wood pipes—so that the amateur may be able to place them in his organ for use either by themselves or in conjunction with the paper pipes described in the previous chapter. I would remark, however, that every variety of tone required may be obtained from the paper pipes, whilst the wood pipes afford but a limited range of tone. The Keraulophon stop, for instance, cannot be made of wood, but is very successful in paper.

It may be of use to beginners in this subject if I state that the open Diapason and the Keraulophon are termed 8 feet tone stops, because, if continued down to CC, that pipe would be 8 feet long. The

stopt Diapason CC is only 4 feet long, but as it gives exactly the same note, it is also termed an 8 feet stop. The Principal (in our case it is called the Flute) is a 4 feet stop, and thus sounds an octave above the unison or 8 feet stops. The Flageolet is a 2 feet stop, and sounds two octaves, or a fifteenth, above the unison. Hence it is also termed the Fifteenth.

As with the other pipes, we shall, of course, require a scale to work from, only it will be necessary to set out a fresh scale for each stop. Draw the line on a board 4 feet 6 inches long, and divide it out exactly as described in the last chapter, but as wood pipes are not round but oblong in plan, two diameters are required for each pipe, instead of only one as in round pipes. The size of the largest stopt Diapason is 3½ inches deep by 2⅝ inches wide, so you set off those distances on the top-most cross-line, and draw the sloping lines from them down to the point 6 inches below the mouth, as shown in the sketch, Fig. 19. By measuring in just the same way as before described, you will be able to obtain the length, width, and depth of each pipe. I have only shown the lowest octave on the sketch, as I think you will have no difficulty now in making a scale for any sized stop you may wish for.

The six largest pipes of the stopt Diapason will be made of ¾ inch pine, and the others will be graduated in thickness till the smallest is only $\frac{3}{16}$ inch thick. You need only take the roughness off the side of the wood which is to form the outside of the pipe, for it is best to plane them up when you have put them all together, as you can then make them look nice, and also graduate the thickness of the wood in regular proportion to the size of the pipes. Let all the wood be of the best quality and free from knots or shakes, as knots are almost sure to loosen some time or other and thus spoil your work, perhaps when you are least able to remedy it. Keep your wood by you as long as possible before using it, so as to ensure its being thoroughly well seasoned. First prepare some wood for the blocks of your pipes, by planing up some lengths of pine about 2 feet long, and gluing a piece of ⅜ inch mahogany on one side of them. Plane

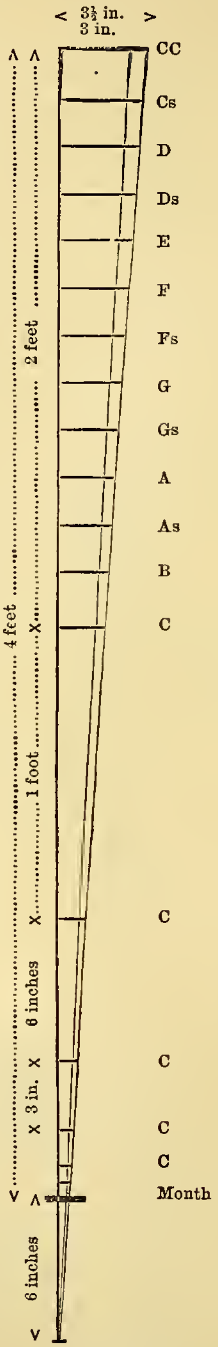


FIG. 19.—SCALE FOR DIAPASON. ⅛th full size.

the first piece down to the size required for the largest pipe, viz., 3½ inches by 2⅝ inches, and cut off a piece 4 inches long; dress the remainder down to the size of the next pipe, but do not touch the mahogany side again, and cut off 4 inches for that one; dress the remainder down for the next sized block, and cut that off, and so keep on till you have cut off all your blocks. The first twelve will be 4 inches long, the next twelve 3 inches, the next 2½ inches, the rest about 2 inches, and these proportions may be used for all the pipes in each stop, as the length of the block is not a very material point provided it is long enough. Now shape the block, as shown in Fig. 20, by cutting a gap with a tenon saw in the mahogany facing, and using a chisel to take out the piece, keeping the same proportions for each block. The sloping part should be cut up to within about a ¼ inch of the top edge, but be extremely careful not to damage the edge. The opening shown in the bottom is a round hole, which will be bored after the pipe is put together, and the foot will be inserted in it. When you have got a dozen or so of these blocks ready, get out the wood for the sides of the pipes, remembering that the sides are the deepest measurement. After planing them true give them all a coat of very thin hot glue on the inside, to stop all the pores, and, when dry, glue the block in between them as shown in Fig. 21. It will be well to preserve the pieces you cut out of the blocks, and glue them between the sides at the top of the pipe, and you will thus have them quite parallel. The pieces glued at the top will be cut out when trimming down. If you cannot get these pieces out without breaking them up, you must cut a slip the same width and use that. While this is drying prepare the backs, treating them with thin glue the same as the sides, and then glue them on to the sides. It will be well to allow both the backs and fronts to lap over about ⅛ inch on each side, so that when you bind the pipes up with strong tape or string to secure the glue joints, the dents so made will be no detriment, as they can be planed off afterwards.

Now prepare the fronts—which only extend down to the top of the block—and cut the chamfer for the

upper lip, and the opening for the mouth, as shown in Fig. 33. It is a very good rule to cut the chamfer as high as it is wide, but the lips had better not be cut too high nor too thin at first, as the height of the mouth will have to be regulated when you are engaged in voicing and tuning, instructions for which will be given in a subsequent chapter. All dimensions for the heights of the mouths, the widths of the windways, the holes in the blocks and feet—in fact, every size except the diameters of the pipes, will be the same for the respective stops as those given in the last chapter for the paper pipes, so there will be no need for me to recapitulate them here. The sizes given for the holes in the feet of the smaller pipes in page 27 must be considered as only approximately correct, as they may require to be made much smaller in some instances. In the wood pipes it is especially necessary that the holes should be large enough to allow plenty of wind to pass. If it should be too large, a small wood plug is inserted at the bottom, to stop off a little of the wind, but it would be awkward to remedy if the hole was too small, as it would entail the enlargement of it right through the length of the foot. You will find the small American planes, which are made of iron, very useful for smoothing the chamfers, etc.

Before gluing on the fronts or backs be sure that they will lay perfectly flat on the edges of the sides, and in order to secure this it is best to shoot the edges with the plane after the blocks are glued in. The front and back surfaces of the blocks should coincide with the lines of the fronts and backs of the pipes. Now glue on the fronts, and bind them up tightly with stout tape or string, and then leave them to dry while you prepare the caps. All the caps should be made of mahogany, those for the stopt Diapason being simply flat pieces the same thickness as the fronts of the pipes. The windway in the block (on the top front edge) should be made with a flat file ; do not make it too deep, but leave the final touching up for the time when you are tuning. You may now with a centre bit bore the holes in the centre of the bottom of the blocks to receive the feet, which are simply round pieces of wood about 6 inches long, with a hole through them of the size required.

Next prepare the stoppers, or tompions, which are shaped as in Fig. 23, and covered with soft sheepskin, so that they will just fit into the top of the pipes, but not too tightly to prevent them being moved up and down. The leather is to be glued on the grained side, and this must be first well rubbed over with glass paper to take off all the smoothness, or the glue will not hold. A mixture of tallow and black-lead should be rubbed on to the outside of the leather when the stoppers are completed, and they will then slip up and down easily, but be sure that they are perfectly air-tight. Let no one persuade you to make stoppers of a piece of board with a handle stuck in the middle, as in consequence of the bearing surface being so small they slip askew and force the seams of the pipes open, thus ruining them. The stoppers should have, at least, 2 inches in depth of bearing surface. I may say that brads may be used in addition to glue for the larger pipes. The feet should not be glued in till it is time to plant them in their places, as you will then be able to regulate them so as to ensure the pipes being upright. File no notches on the edges of the blocks, but leave them quite smooth.

The Bourdon is simply a stopt Diapason, and is made in exactly the same way. The largest pipes may, if you like, be made with languids instead of a solid block, by cutting two pieces of wood, and fitting them into the pipe as shown in Fig. 25, and they may be secured with glue, and small brads. The largest pipe CCC, which may be made of 1-inch pine, is 8 feet long, $5\frac{3}{4}$ inches deep, and $4\frac{5}{8}$ inches wide; the smallest is 2 feet long, $2\frac{3}{8}$ inches deep, and 2 inches wide. The Bourdons should also be furnished with ears as shown at E in Fig. 25. You must not be disappointed with the Bourdons if they do not appear to sound very loud. Close to the organ a mere rush of wind might be heard, but some distance away the sound would be overpowering, in the next house, or two or three houses off, it would, most likely, be voted a nuisance. I may state, however, in order to prevent misapprehension, that it is not advisable to have a separate pedal organ for a room less than 16 feet square. An additional bass stop, to be used in lieu of a 16 feet stop, will be described in the next chapter.

The Lieblich Gedacht (German, lovely stopped pipe) is simply a stopt Diapason of the same scale as the open Diapason. The block is cut out as shown in Fig. 26, and the mahogany facing projects $\frac{3}{4}$ inch above it for CC, and about $\frac{1}{8}$ inch for the smallest. This stop is described to be used in the swell organ of the two-manual instrument, but it may be substituted for the stopt Diapason of the single manual from Tenor C upwards. The stoppers are made in the same way as for the stopt Diapason. The cap is hollowed out, as shown at C in Fig. 26, and Fig. 30 is an inside view of a similar cap. The top of the cap should be slightly below the edge of the mahogany facing, about $\frac{1}{8}$ inch in the largest and $\frac{1}{24}$ inch in the smallest.

We now come to the open Diapason, which is the chief stop in the instrument, but it is only carried down to Tenor C, which, however, being an open pipe, is 4 feet long, the same as the CC stopt pipe ; the width of it is $2\frac{1}{2}$ inches and the depth $2\frac{3}{4}$ inches. It has a straight block with merely a throat cut in it, as shown in Fig 27 ; the cap C is cut out as there shown, and another view of it is given in Fig. 32. The upper

part of this hollow should not be made with the chisel, but with a flat file, as it is very easy to make too deep a windway, and then you would have to reduce the thickness of the cap by rubbing it on glass paper in order to remedy the defect. All hollow caps should be slightly thicker than the fronts of the pipes, and project below the block so as to allow of screwing them on without splitting them. Three, or at most four, small screws to each cap are all that should be required, and the cap should fit so nicely that no wind can escape except through the windway.

We now come to the Flute stop, which is made in a rather different manner, as it has what is termed an inverted mouth, that is the chamfered side of the lip is turned to the inside of the pipe so that the front would appear quite plain all the way down, with merely the mouth cut in it. You must not plane the front of this stop after it is put together, or you will spoil it, all planing for the front must be done before it is glued on. This pipe will require two caps, the inner one being merely a flat piece of mahogany, as in Fig. 29, the exact thickness of the front of the pipe, and having a round hole bored opposite to the throat, and countersunk on the outside. This cap projects above the edge of the block exactly the same height as does the mahogany facing in the Lieblich Gedacht. The outer cap is also hollowed out exactly in the same way as for that stop, but should be level with the top edge of the inner cap. The scale for CC is $2\frac{1}{2}$ inches deep and $2\frac{1}{4}$ inches wide.

Another stop, which may be made of paper or wood, and is called the Gemshorn (German, goat's horn) may be substituted for the Flute. It gives a beautiful, slightly stringy tone, not quite so powerfu as the flute, but more penetrating, and is much used in small organs as a substitute for the Principal. It is conical in shape, the diameter at the mouth being the same as in the flute, but at the top it is only one-third of that diameter. Of course it is rather more trouble to make than the straight pipes on account of the necessity of preserving the proper proportions. If made in paper, one mandrel for every three pipes will be all that is necessary, as you can cut the pipes down at either end to get them to the proper size, and you would make them in much the same way as you make the conical feet, only taking care to have the inside join in a straight line down the pipe. The mouth is cut up one-third of its diameter, and, if made of wood, the block and cap may be like either the Flute or open Diapason, which ever you may desire.

FIG. 33.—OPEN DIAPASON COMPLETE.

FIG. 34.—GEMSHORN.

The Keraulophon, as I have already stated, cannot be made of wood.

The Flageolet stop is made with a block shaped as in Fig. 31, and has an inverted mouth like the flute. The largest pipe is only 2 feet long and the scale is $1\frac{3}{8}$ inch deep by $1\frac{3}{16}$ inch wide. This stop will need great care in making as the pipes run so very small in the treble, and you must be very careful not to let it be too loud and shrill. If you can possibly afford it, make these pipes entirely of cedar or mahogany. The holes through the feet are very small, so the best way will be to glue a disc of thin mahogany on the bottom of the foot so as to close it up entirely, and then drill a very fine hole through it. This, of course, applies only to the smaller pipes of the stop.

The thickness of the wood will be nearly the same for the same sized pipes of any stop, but you may allow stopt pipes to run thicker than open ones, as they give a note an octave lower. The rule is that the thicker the wood the fuller and rounder is the tone. Open pipes are tuned by a lid of soft tin or zinc which is bent down and let into a saw cut made in the thickness of the back of the pipe. This lid should be rather larger than the top of the pipe, but should never be shut right down, raising it sharpens, and closing it lowers the tone.

The pipes are all to be made according to the lengths given in the scale, with the addition of the length of the block. They will all be slightly longer than the tone speaking length, but this is n cessary in order to allow for the stoppers in the stopt pipes, and for cutting down to the right note in the open pipes. The same remarks apply to the scale lengths of the paper pipes. When trimming the pipes down only very narrow pieces should be taken off with the tenon saw, for you can always take off more if required, but it becomes an awkward matter to remedy if you cut the pipe too short. The scales of all the pipes described are small scales, suitable for chamber organs. For a church organ the scales would be much larger.

The lips of the large Bourdons may be made of mahogany and tongued on to the fronts, as shown in

FIG. 20.—BLOCK FOR STOPT DIAPASON. SIDE VIEW.

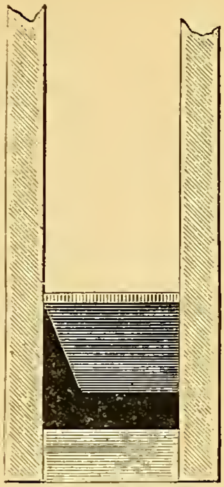


FIG. 21.—BLOCK GLUED BETWEEN THE SIDES. FRONT VIEW.

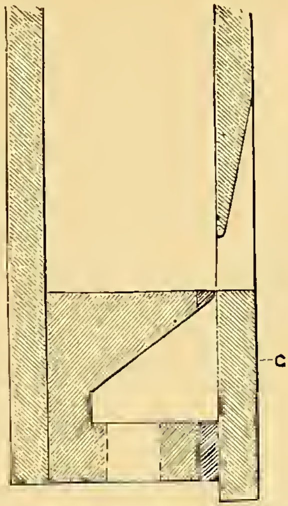


FIG. 22.—SIDE VIEW OF LOWER PART OF STOPT DIAPASON.

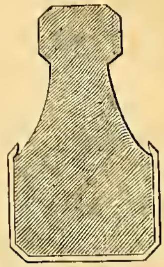


FIG. 23.—THE STOPPER, OR TOMPION.

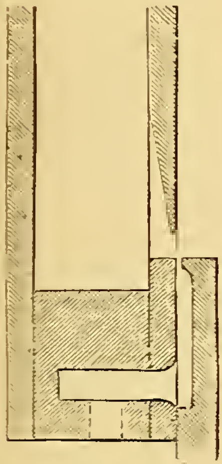


FIG. 28.—SECTION OF LOWER PART OF FLUTE.

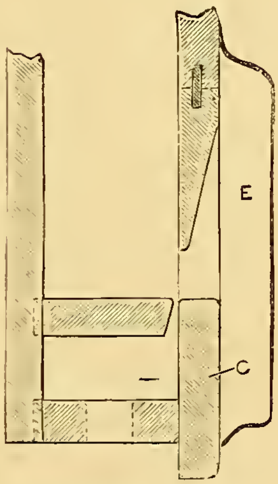


FIG. 25.—SECTION OF LOWER PART OF BOURDON PIPE.

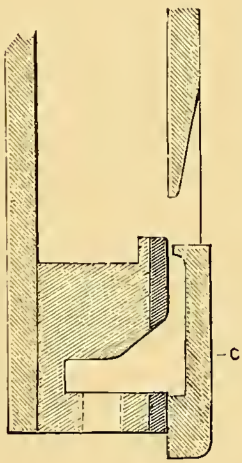


FIG. 26.—SECTION OF LOWER PART OF LIEBLICH GEDACHT.

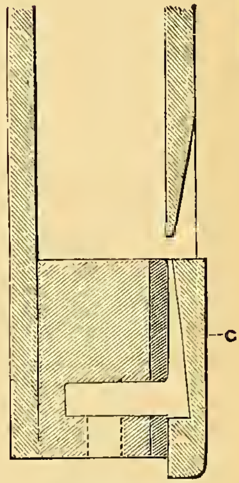


FIG. 27.—SECTION OF LOWER PART OF OPEN DIAPASON.

FIG. 31.—SECTION OF LOWER PART OF FLAGEOLET.

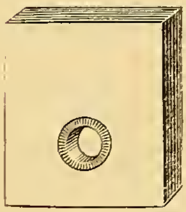


FIG 29.—FRONT VIEW OF INNER CAP.

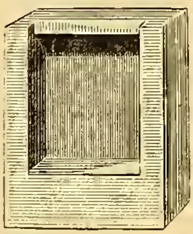


FIG. 30 —VIEW OF INSIDE OF OUTER CAP OF FLUTE.

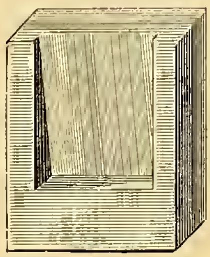


FIG. 32.—VIEW OF INSIDE CAP FOR OPEN DIAPASON.

FIG.24.—SECTION OF PIPE FOOT.

Fig. 25, which is to a scale of $1\frac{1}{2}$ inches to the foot. All the sections in this part, with the exception of Fig. 25, are to a scale of 3 inches to the foot, or one-quarter of the full size. They represent the largest pipe in each stop. The sizes of the throats in the blocks and the sinkings in the caps may be taken from these sections, and should be gradually lessened for each successive pipe, preserving about the same proportions to the size of the block. It is, however, not requisite that the dimensions of the throat should be set out with mathematical nicety.

The pipes, when completed, should be carefully packed away in a dry place in a room where the temperature is about the same as that in which the organ will be built. It is best to complete all the pipes, if possible, before commencing on any other portion of the instrument, as it gives them time to season and settle down, and should there be any defects in the joints they will have time to demonstrate their existence. It is very annoying to find out these defects after you have got the organ into working order, and thus have to leave other work to remedy the mischief. As regards painting the pipes, some persons advocate plain wood, for the excellent reason that the paint is often used to hide bad materials and worse workmanship. This, however, is no reason why paint should not be used on material and workmanship known to be good, and my own experience justifies me in saying that it improves the tone in many cases, and undoubtedly preserves the material, whilst it looks better than plain wood for pipes that are in sight.

In a later chapter I propose to give a few specifications for organs of a larger size, so that amateurs who have plenty of time and money at their disposal, may gratify their wish to possess the best instrument within their reach.

In the meantime I would urge the would-be organ-builder to consider the size of the apartment in which the instrument is to be placed before starting on the work, so that the organ may be suited to the surroundings. It must also be remembered that, though a single pipe does not sound very loud, a full chord on one stop gives a considerable increase in tone, and when all the stops are out and the couplers in action, the noise would be simply unbearable unless great care were exercised to keep down the power of the pipes when in course of construction. For this reason I advocate pipes of small scale, with the mouths not cut up too high, as they can be made to speak up well and yet not be noisy.

Thus far with wooden pipes and the way in which they are made. In the next chapter the sound-board and wind-chest will receive attention.

(*To be continued.*)

PHOTOGRAPHY:

ITS PRINCIPLES AND PRACTICE.

By ARCHER CLARKE.

VI.—DRY PLATE PHOTOGRAPHY.

IT was thought desirable by the original writer of these papers to give a short account of the Collodion process, generally known as wet plate photography, and although, at the present time, collodion is being largely driven from the field and studio, a knowledge of it or *its principles* is highly desirable to every photographer, amateur or professional; and there are many who think it not unlikely some return may be made to the "wet process," even by those who have publicly declared they have done with the nitrate of silver bath for ever, for in many studios a "bath" has to be kept for the class of work a dry plate is unable to perform. Dr. Vogel, a celebrated German chemist, has patented a mixture of collodion and gelatine; those who, when he was over here, had an opportunity of trying his patented emulsion, spoke most highly of it. To produce an article on a small scale, and introduce the same commercially are two very different things; but I think Messrs. Rouch and Co., 180, *Strand*, *London*, are Dr. Vogel's agents.

Argentic gelatine bromide sensitive dry plates, called for short gelatine plates, are the latest outcome of chemistry and science. Many names are mentioned as being nursing fathers to this process, but the three who seem to have done the most to make it public, and bring it to commercial and successful issue, are Messrs. Kennett, Bennett, and J. B. Bolton. The latter gentleman is editor of the "British Journal of Photography," and the first-named gentlemen both amateurs. To Dr. Maddox is ascribed the honour of being the father or inventor of the process, but as the process slumbered for some years after he had shown the possibility of combining gelatine and silver with an heliod salt, and further showing the possibility of developing the same, after exposure in the camera, it's not improbable that without the labour of others, and especially the above named, we might still have been in happy ignorance of gelatine plates. I might just mention here that dry plates are not a novelty in photography; but, take them all round, they required such a long exposure that for portraiture they were useless. The professional photographer, seldom or ever used them for out-door work, and the chief consumers and users therefore were found amongst amateurs, who used occasionally to astonish us at the various Photographic and Fine Art Exhibitions by some Gems—really wonderful productions.

The reason gelatine plates have taken such a hold

upon professionals is because of their speed. Negatives are easily produced in one-tenth of the time; these plates are called ordinary, but plates are made twenty or thirty times quicker than wet plates. And we hear of instantaneous shutters being made, that only permit of an exposure not extending beyond the $\frac{1}{500}$th part of a second. On a recent tour by water round England and Wales, with an ordinary shutter, I succeeded in obtaining well-exposed and sharp negatives of vessels *passing* our steamer while it was going at full speed, and photographs have been publicly sold of an express train going at 56 to 60 miles per hour. If any of my readers will calculate how many yards such a train traverses in one second at 60 miles per hour, they will simply be amazed at the bare thought.

How to make gelatine emulsion will come in its proper place. A slight sketch of the principle involved, and the chemical reactions that take place, with instructions how to use the commercial article—*i.e.*, dry plates—will now be proceeded with. Gelatine plates are an article of commerce, and obtainable from any photo dealer, and for quarter-plates, $4\frac{1}{4}$ by $3\frac{1}{4}$, the price varies from 3s. to 1s. 4d., with a reduction of 10 per cent. if two pounds' worth are taken. The trade pay the same price as amateurs; in fact, in photography there is seldom any difference charged, the only advantage professionals gain is in being able to use, and therefore buy, large quantities, and thus get a discount. Considering their general high price, and the small amount of precious metal that enters into their composition, it pays amateurs and others who have spare time to make their own plates; mind, I am not saying they are dear, for the question of *skill and labour* enters very considerably into the question of cost. A good quarter-plate is very cheap at $2\frac{1}{2}$d., and as excellent plates can be obtained at that price, there is no cause to grumble or complain. Many of the old veterans make their own plates, and many of the new aspirants to photography would do likewise if they only knew how. It is not difficult to make a successful batch of emulsion, this being the name for the argentic gelatine bromide in a liquid state. The difficulty manufacturers find is to make batch after batch alike, equally rapid, equally good, equally well-coated plates, and free from spots and other defects. When an amateur makes a batch, be it rapid or slow, he knows that all the plates coated with the emulsion will be all equal in rapidity, and so guides himself when making an exposure in the camera, but a maker of plates wants his all alike; hence, we have complaints that in the same lot of plates so much variation occurs, as from 20 to 50 per cent. Some makers state how rapid their plates are, others call them rapid, extra rapid, and instantaneous, and when two or three degrees of rapidity are sent out, that maker is more to be depended upon than the man who labels all his plates alike, be they rapid or slow.

Argentum is the Latin for silver, which is known as an element, and written short Ag., its atomic weight being 108·0. The article photographers use is nitrate of silver, which is made by dissolving the metal silver in nitric acid (known as aquafortis) and evaporating the liquid by heat till crystals of nitrate of silver remain in the evaporating dish. The substance now formed is transparent, crystalline, hard, pungent to the taste, and causes a brown black stain if rubbed on the skin with a little moisture, this was known as "horn silver" to the ancients, and is still called lunar caustic by many. Being composed of one or more substances, it is called a compound, and its symbol is $Ag. NO_3$.

Nitric acid is known by the symbol, HNO_3 but upon mixture with the metal silver, and upon the application of heat, H, which stands for hydrogen, is set free, flies off, and so we get $Ag. NO_3$:—its equivalent is 170, that is to say, it combines with some other salt or chemical in the proportion of 170 parts of nitrate of silver, with whatever is the equivalent of the other salt.

As we require bromide of ammonia to make emulsion, we take this salt for our illustration. Bromide of ammonia, symbol $NH_4Br.$; its equivalent 98, although it is in dispute if it should not be 94·4, however 98 is generally accepted and acted upon. So we weigh up 170 parts of nitrate of silver; these parts may be grains, ounces, or pounds, and 98 parts of bromide of ammonia, and the two chemicals, when mixed with water, exactly combine, and we obtain two fresh substances, bromide of silver, Ag. Br., equivalent 188, nitrate of ammonia, NH_4NO_3 equivalent 80. Now if you add 188 and 80 together, you obtain the number 268, which is equivalent to adding 170 and 98, and thus you see although mixed and altered in look, properties, and other characters, nothing has been lost or taken from the other. If more silver is added than the bromide will combine with, then it is called free silver, and so on with any other chemical.

Every article bought for wet plate photography, chemicals or apparatus, is required for dry plate work —perhaps we must except glacial acetic acid; this liquid may be used for the following purposes: as it is, a drop now and again on a wart or corn will go a long way towards removing them; and if the acid is diluted, it makes the best white-wine vinegar.

The extra chemicals required: Liquid ammonia ·880, bromide of ammonium, bromide of potassium, cyanide of potassium, ground alum, bi-chloride of mercury, two small bottles, different shapes, each holding 4 to 6 ozs., 1 dozen dry plates, one or two flat ebonite or papier-mache trays, to suit the size plates you

intend making; quarter-plate trays for quarter-plates, and whole-plate trays for whole-plates; the object being, not to use more of the chemicals than are actually required to develop the image on the plate.

The dry plates of C. E. Elliott, 36, *Jewin Street*, are sent out in a grooved box, these will be found more useful for keeping the plates in, when made into negatives. The plates of Messrs. Marion, *Soho Square*, are a trifle cheaper than Messrs. Elliott's, but are not packed in grooved boxes. There are now so many makers of dry plates that it would be impossible to mention or try all. The full list of apparatus and chemicals required for dry plate work will be as follows:—

Camera, dark slides, lens or lenses, tripod stand, focussing cloth, dry plates, flat dish same size as plates, unless you are able to develop two at one time, this is not advisable for a beginner; ½ lb. liquid ammonia ·880 in a 20 oz. *stoppered* bottle, ¼ lb. bromide of potassium, in a wide-mouthed *corked* bottle, 1 oz. pyrogallic acid best, 1 lb. ground alum, costs 4d. to 6d. at any oilshop, scales and weights, those that weigh up to one ounce, with weights from 1 grain to 60 grains, glass graduated 2 oz. measure, two or three developing cups, 4 ozs. citric acid, hyposulphite of soda, and a dish for containing the same in solution, a pie-dish comes in useful here, in fact two—the other for the alum in solution. Get them different shapes or colours to avoid mistakes. The same solution of hypo. that is used to fix the prints, will do to fix the negatives in if great economy is desired, or if the hypo. bath is handy; but it is better to have a fresh bath for each part of the process.

How to expose the plate, and for how long, has been fully treated in Part IX., page 420, with this important difference, that the exposure *must* be at least ten times less, and if very rapid plates are used, from fifteen to twenty times less. It is a curious fact, that amateurs generally under-expose their plates in the wet process, but more often than not, over-expose them with gelatine plates. It is also needful to use a diaphragm, or stop, in the lens with a gelatine plate. Now this was optional in wet plate photography. Suppose your lens is supplied with six stops, for a gelatine plate, use the second or third, counting from the largest; this would suit a group, but for a building, if near, I should use the smallest; the smaller the stop, the longer the exposure. Why use a stop at all? many may feel inclined to exclaim; the defects in all lenses, and the plates require it, the reason will be treated later on. Where instantaneous shutters have to be used for moving objects, sometimes the diaphragm is dispensed with, or if used, only the largest size stop. Personally, I would always sooner use a stop, and even at the expense of one or two seconds' longer exposure. Opticians are gradually making the diaphragms of their lenses agree with each other; but with the present lenses stops are arranged after the following methods:—

Each stop counting towards the smallest, requires twice the exposure of the one next larger, but some makers arrange that the exposure should only be half as long again; in the first instance, take one second for the normal exposure of the largest stop, and there are five stops, it would be thus: 1, 2, 4, 8, 16, and in the second case, say nine stops are supplied, 1, 1½, 2, 3, 4, 6, 8, 12, 16. With single lenses, three stops are generally supplied—the largest, for rapid work and portraits; the middle, for groups and objects fairly close to the camera; and the smallest, for views, buildings, both used close up, and if distant, in using a single lens, the building should not be too near or the straight lines will be barrel-shaped. Suppose your lens has a 6 inch focus, and you use the smallest stop, anything 24 feet distant, right down to the horizon will be sharp and distinct.

The exact proportions of ammonia and bromide of pyro. to be used with gelatine plates, are to be found in the instruction paper issued with each package, but should any difficulty be found in working with these instructions, the following is a very reliable developer:—

No. 1.

Liquid ammonia ·880	...	...	2 drachms.
Bromide potassium	...	...	30 grains.
Cold water	... ...	...	4 ounces.

Stoppered bottle.

No. 2.

Citric acid ... 6 grains. | Cold water ... 4 ounces.

Corked bottle.

When dissolved add

Pyrogallic acid ... ... 64 grains.

To use; lay the exposed plate in the flat dish, and swill under the tap or jug; this prevents air bubbles forming. Cover the dish with any opaque substance, a piece of wood, cover of book, sheet of ruby glass, an old slate; now measure out 1 drachm of No. 1 into your developing cup, and add 1½ ounces of water, remove cover, and pour this evenly over the plate, against the edge, not on the plate; now take 1 drachm of No. 2, pour that also into the empty developing cup. Take the dish containing the plate and No. 1 solution in the left hand, and add about half the solution in the dish to No. 2 in the cup; now return No. 2 and the additional solution to the dish, rock it gently to and fro, so as not to spill any, and cover it over, at the same time just lifting the same up every five to ten seconds while you count thirty slowly. If properly exposed, you will generally see some faint indication of the image now coming up: the high lights will

appear faint, and so the image will grow in intensity and detail. Most plates require to be developed till everything appears buried or lost in a fog; and if you have seen the image gradually grow up and lose itself, as it were, when it comes to be fixed all will be right.

We will now treat of two causes of failure most common: over-exposure and under-exposure; but before doing so, the action of the four chemicals will be explained.

Liquid Ammonia.—This does not develop, but accelerates the action of the pyro.; this gives detail.

Pyrogallic Acid.—This is the true developer; but it is slow, hence ammonia is added to hasten the development and give detail. When the image is fairly out, but looks thin, more pyro. may be added to give greater density—hence the saying, ammonia for detail, pyro. for density; but under some conditions, ammonia appears to impart to the *half-developed* negative as much density as the pyro.

Bromide.—This acts like the acid on the wet collodion process; keeps the shadows clear, prevents the too rapid reduction of the particles of bromide of silver in the film, and so retards or restrains the action of the developer, thus allowing the high lights to obtain their share of deposit, and so produce an harmonious negative.

Citric Acid.—This enables pyrogallic acid to be kept in a liquid state without discolouring, and so becoming useless. Various other substances are used and recommended, as nitric acid and sulphite of soda—mind, *not* hyposulphite of soda.

How to apply the Above.—If the image is known to have been over-exposed, add more pyro. No. 2, and use less ammonia, No 1. Many operators keep two small bottles—one containing bromide and the other ammonia, and are thus enabled to check or accelerate the development as it progresses. Should the image be known to be under-exposed, use less pyro. No. 2 and more of No. 1. It is often a good plan to develop out say for one or two minutes, before adding any more of No. 1, that is, to obtain the density before you have the detail, in case the fault is not discovered till the developer is applied. If the image flashes out directly, or nearly so, the moment No. 2 is added, and you can see almost all the picture, pour off the developer into your cup, flood the plate with water, or wash under the tap to stop further action. Now take, say, 1 drachm No. 2, and 2 drachms out of the developing cup, add sufficient water just to cover the plate, and if you have any bromide separate, add a drop or two of that also. By thus keeping the ammonia down, and prolonging the development, a passable negative may be obtained.

Now, after developing for a minute, and no trace of any image appearing, or only just a faint image, then add, say, 1 drachm of No. 1, and perhaps you will require to add 2 or 3 drachms more; but it is well to add a little more pyro. No. 2, as without this, development does not go on.

The plate having been developed is now washed without removing it from the dish. It is next immersed in the alum for a short time, say 1 minute, this hardens the film, and takes out any stain the prolonged development may have caused; it is again washed. The plate may now be handled, if desired. It is next placed in the hypo. or fixing-bath, and remains there till all the unaltered bromide of silver is removed, this may be seen by looking at the back of the plate; after it is removed, the plate should still remain in the hypo. another 3 to 5 minutes, when take out and well wash, then placed to soak in a dish of cold water, this changed several times. The negative is now passed under the tap, and stood in a drying-rack, see Fig. 15, Part IX., when quite dry, varnish. Stop out any transparent spots, and print in the usual manner.

Formula for the plain solutions of bromide, liq. ammonia, alum, and hypo.:—

Bromide ammonium, 60 grs.	Cold water ... 1 oz.
Liq. ammonia ·880, 1 drachm.	Cold water ... 2 ozs.

The above in separate bottles; it is best to always use a stoppered bottle for solutions containing liq. ammo. Powdered alum (any quantity), say ½ lb., in a pint jar or jug, fill up with warm water, and stir. When cold the alum and water are in the condition known as a saturated solution; of this solution use just half enough to fill the dish you intend to use, and add cold water to fill the dish or tray. It is now at half-saturation point. By use it receives a colour something between port and sherry; it should be thrown away, and a fresh lot made.

Hyposulphite of soda:

Hypo. ... ... 2 ozs.	Water ... 13 ozs.

This may be used several times. When discoloured or exhausted, throw away.

Many operators prefer to take one print from the negative before varnishing, just to see if it will print satisfactorily, as sometimes they are over-dense, and at others too thin. If the negative is dense, through the film being stained in the developing, and the alum bath having failed to remove it, then, after washing and draining, but while still damp, immerse it in the alum again, and let it remain there any time you like, say, half a day. It is best to use fresh alum for this purpose, and, if you have a spare tray, use that. The following is more energetic than plain alum, it not only removes discolouration, but reduces an over-dense or an over-developed negative:

Alum ... ... ¼ oz.	Citric acid ... ½ oz.

Water ... ... 3½ ozs.

This can be used over and over again till exhausted. Its action is fairly rapid, and the plate requires watching. The operation is generally completed in from 15 to 50 seconds.

Should the negative be too thin, and print flat, it may be intensified by the following method :

Bi-chloride of mercury	200 grs.
Bromide of ammonium	200 grs.
Water	10 ozs.

This is best kept in a wide-mouthed pickle bottle, and can be used over and over again. Immerse the plate in this till it becomes quite bleached and white, it will take 10 minutes ; now wash well, and immerse or pour over the plate the following :

No. 1 Solution for developing ...	$\frac{1}{4}$ oz.
Water	10 ozs.

It will now assume a black tint, which is very non-actinic, and prints well. Should the plate be very thin indeed, instead of using the No. 1 solution as above, after removal from the mercury bath, and well washing, use the following :

Nitrate silver ... 2 drachms. | Water ... 10 ozs.

When dissolved, add

Cyanide of potassium ... ... 2 drachms.

Apply this exactly like No. 1, as above, only remember that cyanide of potassium is a most deadly poison, you will know it best doubtless as prussic acid ; and cyanide of silver is likewise as deadly.

After the plate is developed, much more light may be admitted into the dark room, but it must still be of a ruby yellow colour. It is not till the plate is in the hypo. bath that white light may be allowed to shine upon it, and it is really best not to let the plate see white light till it is fixed.

(*To be continued.*)

WAYS AND MEANS.

[The Receipts brought together under this title are gathered from various sources. They are given here because they are each and all apparently possessed of value, and likely to be useful to the Amateur. It is manifestly impossible for the Editor to test them, or to have them tested, and he therefore disclaims all responsibility for their accuracy or otherwise. Amateurs who may try them are requested to communicate the results arrived at.]

Stencil Ink for Wood.—An excellent stencil ink for boxes and packing-cases can be made by mixing lampblack, fine clay, and gum-arabic together. The lampblack gives the colour, the clay furnishes a body, and the gum an adhesive. Water will answer as a solvent, but lampblack is so light, that a few drops of vinegar or other acid will facilitate its admixture with the other ingredients. Any good adhesive substance, such as dextrine or gum-tragacanth, may be found to answer as well as gum-arabic to bind the mixture.

Water Glass.—The following are the proportions of the various materials used by English manufacturers for producing water glass by fusion in crucibles : Pure quartz, 45 parts ; powdered alkaline carbonate, 23 parts ; charcoal, 3 parts. Another recipe is : Quartz sand, 100 parts ; caustic soda or potash, 48 parts ; and charcoal powder, 5 parts. Or, washed quartz sand, 65 parts ; anhydrous alkaline carbonate, 34 parts ; and charcoal powder, 4 parts. The mixture is heated to redness, until entirely fused, and the contents are cast on tin plates for cooling, and finally crushed. Water glass is used for a large number of purposes in the arts, but it might find many every-day uses if better known. Mixed with chalk, it forms, on drying, a compact, marble-like stone ; bone ash, zinc white and magnesia with water glass form similar stones. Ransom's artificial stone is prepared by mixing sand with water glass solution to form a plastic mass, which is pressed into the required shapes and then placed in solution of calcium chloride ; silicate of calcium is formed and cements the grains together, the chloride of sodium formed at the same time being removed by washing with water. With clay, lime, sand, cement, etc., soluble glass enters largely into the composition of many of the patented artificial stones, plastic tiles, slates, etc. The detergent properties of water glass make it an excellent scouring material, and it enters largely into the composition of most of our common soaps.

Cement for Boiler Joints.—To make a cement for boiler joints, take 10 parts of white lead ground in oil, 3 parts of black oxide of manganese, and 1 part of litharge. Reduce to a proper consistency and apply where needed.

NOTES ON NOVELTIES.

THERE must be many who have felt at one time or other in their lives how desirable a thing it would be if they could meet with any cheap and simple contrivance, by m which they might be enabled to reproduce and multiply copies of any written document or sketch without having recourse to the aid of the printer or lithographer, whose assistance necessarily entails expense, for labour must be paid for, of whatsoever kind it may be.

Of late years it is true that many varieties of one and the same process have been brought before the public, by which the reproduction of writing or pen-and-ink drawing can be effected without any difficulty whatever ; but it is true that none of them have been taken into that lasting favour which is generally accorded to inventions which are truly useful, because they produce results which are in every way satisfactory to those who are induced to make trial of them. I have said that many varieties of the same process have been

brought forward as competitors for public favour, and I may be permitted to explain that by this I mean that although various machines under different names have been put in the market within the last few years for the reproduction of writing by simple means, the principle of the process to be followed is the same in all, and that it is merely in name that they differ, and only partially in that.

The process, when described, is simply this : The writing is traced on paper with a pen dipped in a particular kind of ink, which may be described as being for the most part some aniline dye. The paper is then laid on a composition familiarly known as a "graph" composition, while the writing is still fresh and moist, and when the paper is removed, after a moderate amount of pressure has been applied to it, the impression of the writing appears on the "graph" in reverse. From this impression copies are then taken by gentle pressure on pieces of paper laid on the "graph" one after another ; but, as may be easily supposed, every successive impression gets weaker and weaker by the exhaustion of the colouring matter that has been transferred to the "graph" from the original piece of writing, while, in many cases, the entire number are blurred and indistinct owing to want of care or want of skill on the part of the operator at the very commencement of the operation of printing off the impressions. The essential point. then, in which every member of the large family of "graphs" may be considered to fail, is in its manifest ability to furnish any number of impressions of equal clearness and depth of tone throughout ; and, secondly, the impression on the "graph," from which the copies have been printed is unavailable for further use, partly because it is not possible to print from it a second time after the transfer ink has become dry, and partly because, when done with, the ink must be washed off the "graph" to bring the latter into a fitting state to receive the next impression that it may be necessary to place upon it.

These manifest defects appear to have been completely overcome in the Trypograph (Zuccato's Patent), manufactured and sold by Messrs. Zuccato and Wolff, 15, *Charterhouse Street*, *Holborn Viaduct*, *London*, *E.C.* I will now endeavour to describe both the process and the apparatus for the information of such of my readers who are not acquainted with them. With regard to the apparatus, this is made in different classes and in different sizes. There are two classes, known as Class A and Class B. The machines composed in Class A are made to print quarto (10 inches by 8¼ inches), foolscap (13 inches by 8½ inches), post folio (16½ inches by 10½ inches), and brief or even larger sizes, these last being made to order, and are sold at prices ranging from £6 6s. to £12 12s., according to size. Those comprised in Class B are made to print 8vo (6¾ inches by 4¾ inches), or any smaller size, quarto (8½ inches by 7¼ inches), foolscap (12¼ inches by 7¼ inches), and post folio (17 inches by 9¼ inches), being sold at prices ranging from £1 11s. 6d. to £5 5s., according to size. The sizes given indicate in every case the actual printing surface, independent of margin. The machines included in Class A are more substantial, and can be worked more rapidly than those in Class B, and are therefore more suitable for use in offices, while those in Class B are sufficient in every respect for home purposes. Each apparatus is supplied with all the necessary adjuncts, and materials, and instructions for working and carrying out the process, in a strong box, nicely stained and varnished.

Supposing that a case of the smallest size has been purchased—for a description of this will serve for all—the first thing that will call attention is the paper that is supplied with the apparatus. This paper is of three different kinds. There is some stencil paper, which must be kept flat and dry, and there is some blotting paper, and some paper also that is specially adapted for use with the Trypograph—that is to say, for producing copies by the method of printing that is adopted. Now the stencil paper that has been mentioned is the paper that is employed for the purpose of producing the original from which the copies are to be printed, and it is necessary now to see how this may be done. On looking among the apparatus, a small board will be found, slightly sloping towards the lower edge in front. This board is about 7 inches by 5½ inches, and in the flat upper portion is inserted a metal plate 4½ inches by $1\frac{3}{16}$ inches, whose surface is cut or corrugated in such a manner as to resemble the surface of a very fine file. A stylus, or iron-pointed pencil will also be found. In order to produce a stencil for printing, a piece of stencil paper must now be taken, and the portion of it on which it is intended to write must be laid on the plate. The stylus must now be passed over the stencil paper, as the ordinary pen is passed over the paper in writing, but with this difference—namely, that the up and down strokes must both be made with a firm and equal pressure. The action of the stylus, in conjunction with the roughened plate below, produce a number of minute holes or perforations in that part of the paper over which the stylus is passed. Each part of the stencil sheet is brought in turn in an upward direction over the metallic plate until the writing is complete, and ready for the production of copies.

A further search among the apparatus will lead to the discovery of a deal frame, with a raised panel in the centre ; the frame measuring 9¾ in. by 8⅜ in., and the central panel, which is raised above the frame just ¼ in., is 8½ in. by 5⅞ in. Attached to the deal frame by hinges, as shown in Fig. 1, is another frame, of which the sides are of wood, and the top and bottom of four pieces of brass of equal thickness, two at the top and two at the bottom. The inner pieces are fixed, and form, with the wooden sides, the solid part of the upper frame ; the outer pieces are moveable on pins, passing through and fastening the ends of the pieces to the left hand side of the frame, and are held in their place when brought against and close to the fixed pieces of brass by brass hooks, as shown in the illustration. The stencil-sheet is then placed in the moveable part of the frame, the ends being held tightly between the brass plates at top and bottom, as shown in Fig. 1, and the piece of paper on which the impression is to be taken is laid on the panel below it, being held firmly in position by the pressure of the fixed pieces of brass that form the top and bottom of the upper frame.

The stencil, and the paper on which the impression is to be made, being duly placed in position, the next thing to consider is how the process of printing is effected. For this there are four appliances which require notice : the first

being a bottle of trypographic printing ink ; the second, a saucer for the reception of the ink when poured from the bottle ; an indiarubber scraper or squeezer, consisting of a handle screwed into a piece of wood, which carries a double piece of indiarubber along the lower edge, firmly fixed in a groove cut to receive it ; and a brush, with which the ink in the saucer is smeared along the edge of the scraper. In addition to these is a tin tray, in which the upper portion of the scraper is placed when not in use.

Everything being now ready for the process of printing, the scraper is taken in the right or left hand, as may be found convenient, and passed up and down over the stencil paper. The ink penetrates through the minute holes in the stencil, produced by the joint action of the stylus and the corrugated plate, and forms an impression on the paper below. This sheet is immediately removed and a fresh one put in its place, and the process of printing repeated as before. The durability of the stencil paper is such that it is said that an average maximum of five thousand copies may be printed from it, every impression that is taken being equally clear and good.

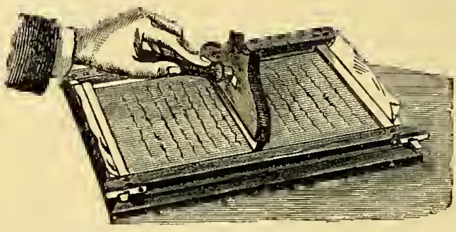


FIG. 1.—MODE OF PRINTING WITH TRYPOGRAPH.

From the description that has been given it will be easily seen that nothing can be more simple than the apparatus that is used, and the means employed for obtaining impressions from the stencil plate, the impression obtained being remarkably sharp and clear, and by no means blurred and wanting in distinctness, or *rotten*, as the technical term goes, as might have been expected. The Trypograph is, as the patentees claim for their meritorious invention, cheap, reliable, and cleanly, and the process is both easy and rapid. It is the only apparatus of the kind by which printing in indelible black can be effected ; it is capable of producing at least as many as five hundred times the number of impressions that can be obtained from the best of the "graphs," and any child or office boy can produce the impressions from the stencil paper, or, in other words, do the work of printing. The rate of production of impressions may be estimated at from four to six per minute, but this must of course depend on the skill and dexterity of the operator. The stencil paper remains uninjured by the process, and can be laid aside and used for producing copies as often as may be required. Materials for use with the Trypograph, such as stencil paper, printing colour, whether black, red, blue, or green, and printing paper, can be procured at moderate rates. It is not necessary to use the printing paper specially sold for the purpose, but if other paper, especially highly glazed paper, be used, it is desirable that the copies should be allowed to dry for a few minutes before being placed one upon another.

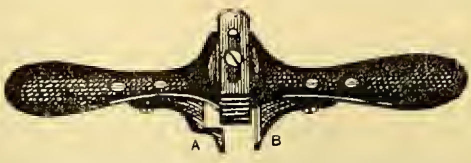


FIG. 2.—IMPROVED CIRCULAR RABBETING AND FILLISTER ROUTER.

The above must be taken as a description of the process embodying all the principal points that are involved in it. There are others, especially with regard to the use of the blotting paper supplied with the apparatus, and the mode of inking the scraper, that I have not touched on, but these will be learnt from the ample instructions that are sent out with every set of apparatus. Sufficient has been said to show the *modus operandi* generally speaking, and to demonstrate the superiority of the Trypograph over all other copying apparatus, or, as I may be allowed to express it, *omne quod exit in "graph."*

Of books I am asked this month to notice two. The first of these is published by Messrs. Crosby Lockwood and Co., 7, *Stationers' Hall Court*, *Ludgate Hill*, and forms No. 156 of "Weale's Rudimentary Series," the price being 1s. 6d., the size $7\frac{1}{8}$ in. by $4\frac{1}{4}$ in., and the number of pages, 107. The book is the sixth edition, with prices revised to the present date (1882), of "Quantities and Measurements, how to Calculate and Take them in Bricklayers', Masons', Plasterers', Plumbers', Painters', Paperhangers', Gilders', Smiths', Carpenters', and Joiners' Work, with Rules for Abstracting, Hints for Preparing a Bill of Quantities, and Prices for all Work in the Building Trade," by Alfred Charles Beaton, Architect and Surveyor. The general title of the work, which I have given in full, will sufficiently intimate its aim and scope, and the fact of its having reached a *sixth* edition will be ample testimony to its utility, and the favour with which it has been received. Amateurs will find it of great use to them in considering the charges of builders and workmen for all kinds of work in the building trades as per estimate for work to be carried out, or as per account for work done, as it will enable them to arrive at the amounts which would probably be allowed by a surveyor for the work under consideration, and thus to avoid the possibility of any overcharge. My last adventure of this kind was with a carpenter, who modestly sought to relieve me of £9 for some work, which, when valued at its utmost, was worth not a fraction more than half the money. As may be supposed, I declined to be plundered at this rate, and submitted the matter to a surveyor, who reduced the amount of the account by £4, and my hungry friend not only signed the surveyor's note-book in token that he accepted the award, but expressed himself as being satisfied with what he was allowed to receive !

The other book that lies before me is "The Wheelman," a Magazine for Cyclists, produced under the auspices of "The Wheelman Company," 168, *Washington Street*, *Boston*, *Massachusetts*, and published in this country by Messrs. Iliffe and Son, 12, *Smithford Street*, *Coventry*, from whom all information respecting the work may be obtained.

The price in America is two dollars per annum, or twenty cents. a number, so I presume its price per number here will be 10d. or 1s., and this it is well worth, both for the excellence of its subject matter and the number and beauty of its illustrations. It is of the same size as this Magazine, but contains eighty pages. The contents are numerous and varied, and consist of articles on cycling and matters akin to it, mostly from the pens of American writers. The illustrations, which are confined to a single article, entitled, "A Wheel Round the Hub," are twenty-six in number. The magazine is greatly in advance of anything that is published for patrons of the bicycle and tricycle on this side of the Atlantic.

Mr. A. S. Lunt, *Saw, Plane, Tool, and Cutlery Manufacturer*, 297, *Hackney Road, London, E.*, has sent me a tool which will prove of great value to all amateur woodworkers. It is one of the numerous progeny that find their original type, as far as form and mode of using are concerned, in the old spokeshave and drawing-knife, being an ingenious adaptation of the principle on which these tools are constructed. It is called the "Improved Circular Rabbeting and Fillister Router," and its purpose is sufficiently implied by its name. It is illustrated in Fig. 2, to which I shall refer again presently, and which affords an illustration of the front of the instrument—the part which is turned towards the operator, showing the front of the cutting-iron, and the adjustable fences with which the tool is furnished. It has, in fact, as the illustration shows, two kinds of fences, which enable it to be used either as a rabbeting router or moving fillister router at the pleasure of the worker. Most amateurs will have felt the difficulty of making a rabbet or rebate with the ordinary rebate plane used for this purpose, and many will have solved it by nailing one piece of wood on top of another in such a way that the edge of the lower piece projects for a little distance beyond the edge of the upper piece, thus forming along its length the step-like depression to which the term rabbet or rebate is applied. To make my meaning perfectly clear to those beginners in carpentry who may not exactly comprehend what a rebate is, suppose that Figs. 3 and 4 represent sections of a wooden bar, or piece of wood of any kind. Now when the rectangular portion marked A in Fig. 3 is removed along the whole length of the piece of wood, the wood is said to be rebated. It has been cut indeed after the manner of the underpart of the moulding of a picture frame, and a depression is produced, into which anything may be dropped, as the glass, picture, and backboard into the rebating of the picture frame when complete. When a piece of wood is rebated on both sides, as by the removal of the rectangular pieces B and C in Fig. 4, glass or a thin panel can be dropped in on each side of the central ridge that is left. This is the double rebating that is used in making the bars of sash frames.

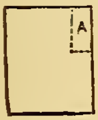


FIG. 3.—SINGLE REBATE.

Now an inspection of Fig. 2 will show how admirably adapted this tool is for cutting rebates. It has been said that two pairs of adjustable fences are supplied with it, two being in the form of A, and two in the form of B. These fences slide along grooves in the handles of the tool on each side of the cutting-iron; and by means of slots in the fences themselves and screws, which are inserted in holes cut for their reception in the hands, may be adjusted to any distance at which it is possible or desirable to work the tool.

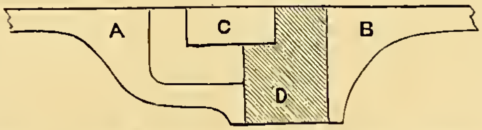


FIG. 5.—ADJUSTMENT OF ROUTER FOR CUTTING REBATES.

For cutting a rebate, such as is shown in Fig. 3, the fence B is adjusted to slide along the edge of the bar, in which no rebate is required, leaving the necessary thickness between the fence and the cutting-iron, and the other fence, A, is then moved up to the edge that is to be rebated, and *over* the cutting-iron, so that no more of the edge may be brought into operation beyond that portion which corresponds to the proposed depth of the rebate. If another rebate is required on the other side, as at C in Fig. 4, the position of the fence is reversed and the operation is carried out on the opposite side as before, thus forming the double rebate. The action of the tool will perhaps be better understood from Fig. 5, in which the *face* of the tool is supposed to be turned towards the operator, and in which A and B are the fences, as shown in the representation of the tool in Fig. 2, C the cutting-iron, and D the wood which is being rebated.

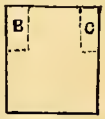


FIG. 4.—DOUBLE REBATE.

For cutting a fillister, or, in other words, using the router or cutting-iron so as to work out a groove in the surface of a strip of wood, both the shouldered or fillister fences are used, and these are adjustable so as to produce a thickness of from ⅛ inch to ¾ inch on each side of the cutting-iron according to the thickness of the wood in which the groove is to be made. The relative positions of the fences, the cutting-iron, and the wood, are shown at A, B, C, and D, in Fig. 6, the cutting-iron representing the section of the groove that is being cut. The cost of the tool I must not omit to say, is 3s. 6d. As the width of the cutting-iron is ⅞ inch, it is manifest that it will cut a rebate of the same width, or any width under ⅞ inch. It is not so accommodating in the matter of grooving, for the cutting-iron will only cut a groove of its own width. Its utility is obvious, even with its present construction, but if, with a little contrivance, it could be adapted to carry irons of different widths so as to cut grooves of different widths, it would be rendered twice as serviceable as it is now, and the necessary increase in cost would be covered, and more than covered, by the extension of its capabilities.

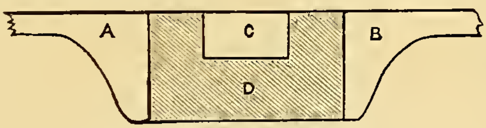


FIG. 6.—ADJUSTMENT OF ROUTER FOR GROOVING FILLISTER.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

*** TO MY READERS.—By one of those unfortunate mishaps which will sometimes occur in spite of the vigilance and care of all who are chiefly concerned in the production of printed matter, *a dislocation of type*, as it may be termed, occurred in page 20, in Part XII. of this Magazine, which, by breaking the natural sequence of the text, went far to spoil the paper on "Overglaze Painting on Porcelain," by Aurelio de Vega. If the line, "*What to Undertake.*—If, however, the work be," now at the *top* of the first column of page 20, be transferred to the *bottom* of the second column of the same page, the text will read correctly. The publishers have caused cancel pages of pages 19 and 20 to be printed, which will be forwarded to any subscriber who may care to apply for them.

Sale of Fret-work.

E. M. (*Boxmoor*).—I regret very much that I cannot tell you where you may find a sale for your fret-work. Possibly you might be able to make arrangements with some local dealer in fancy goods.

W. S. (*Newcastle-on-Tyne*).—With the multiplicity of subjects on hand it is not possible to give a series of papers on Model Ship Building at present. You can purchase all the small fittings for model ships from two firms dealing in articles of this description that are mentioned in "Notes on Novelties," in Part XII.

Type Metal.

GEMAKST.—Among the early printers lead was chiefly employed for type metal on account of its softness, but this was soon found to be a disadvantage, and a small quantity of iron was added to the lead in order to harden it. Regulus of antimony is now added to the lead for this purpose instead of iron. The proportion used to form an alloy for small types is one part of regulus of antimony to three parts of lead, for the larger types, about three parts of the former to seventeen parts of the latter are used.

Shampooing Mixture.

J. R. B. (*Thanet*) writes :—As a shampooing mixture A. H. R. D. G. will find a pennyworth of salts of tartar, dissolved in two quarts of warm water, all that need be wished, if he requires it for his own use. If however, he wishes to make a mixture to advertise and sell, the above will not answer, the salts of tartar having the property of absorbing moisture so rapidly from the air, as to become useless when exposed. [No queries of this nature will be noticed in future in AMATEUR WORK, ILLUSTRATED. ED.].

Ferneries.

W. EDMEAD.—An illustrated article, the first of a series on this subject, is in type, and will appear in an early part.

Banjo Making.

A. M. (*Ardislaw*).—Never having made a banjo I cannot give instructions how to make one. The best banjos in the world are the five-stringed Stewart banjos which require expensive machinery, and could not be made by an amateur. They are sold in this country only by Mr. J. E. Brewster, of 20, *Oxford Street*, who would give you the lessons you require by his lightning American system, without notes or music.

Æolian Harps.

H. J. N.—Your measurements will be found quite correct. At some future period we may give directions for the construction of Æolian Harps in all their forms.

Organ Building.

W. G. W. (*Reigate*).—The straight part of the languid should be ⅝ of the inner circumference of the pipe, but it does not matter much if it is taken on the outside, provided you adhere to the same rule with all the rest of the stop. The triangular piece is cut out of the lower languid, merely that it may not interfere with the windway and need to be of a particular size. The piece cut out of the tube is to be 1 inch in height for the trial pipe, not 1 inch in length of side of the triangle.

EIGHTEEN YEARS OLD AMATEUR.—The open diapason only extends to Tenor C, consequently the longest pipe is only 4 feet long as stated. The term "small scale," as applied to any stop, refers to the diameter of the pipes, and never to the length. The CC pipe of the principal is 4 feet long, and thus sounds an octave higher than the stopt diapason, or the same note as the Tenor C open diapason; the flageolet sounds 2 octaves higher than the unison pipes. You will get the scale of the lowest octave of the stopt diapason by setting off a line 4 feet 6 inches long, and dividing the upper 2 feet portions into 12 parts, as shown in the scale already given, but setting off the diameter, viz., 3¼ inches, instead of 2⅝ inches, as shown on the top cross line, and draw the sloping line down to the point as usual.

C. H. B. (*Oldham*).—We are sorry your query has been overlooked. It is not necessary to use mahogany for the blocks of the pipes, as pine answers just as well if faced on the front with thin mahogany. As regards squaring the blocks, use a small square to test them with while planing up.

J. H. H. (*New Normanton*).—I do not think you quite comprehend that though the pipes of each stop, except the flageolet, run to 4 feet long, they differ in diameter for each stop. For instance, the CC in the principal will be the diameter of the Tenor Cs of the open diapason. The Tenor C of the keraulophon will be the same diameter as the Fs above it in the open diapason, thus making it 6 scales smaller than that stop, and 5 scales smaller than the CC of the principal. If the open diapason were carried right through, the longest pipe, viz., CC, would be 8 feet long, the same with the keraulophon, hence they are termed stops of 8 feet tone. See also reply to EIGHTEEN YEARS OLD AMATEUR.

A. H. (*Cambridgeshire*).—In the articles now in preparation, directions will be given to enable amateurs to build an organ of less height than 8 feet; but unless the compass is considerably curtailed at the bass end, an organ must be at least 6 feet high.

S. S. (*Nottingham*).—Specifications for larger instruments will be given in the later chapters of this series of articles.

POOR OLD MUSIC.—If you require another stop on your small organ your best plan will be to add a principal throughout, that is a set of pipes sounding the octave above those which you have already made. This will give brilliancy to your organ. The longest pipe will be 4 feet and the shortest 2¼ inches (approximately). Follow the instructions for making the flute stop given in Part 12; and as regards the other portions of the instrument full instructions will be given in Part 14 for making sound-boards, and you will do well to adopt the one with the 12 bass channels placed at the back as will there be described. All other details will follow in due course.

J. R. (*Jedburgh*).—Instructions as to attaching pedals to a pianoforte may, perhaps, be given at a future time.

H. E. H. (*London*).—An organ with full compass pedals could not very well be blown by the foot when using the pedals, though a foot blower may be attached for convenience when not using them.

A. GILL. (*Glasgow*).—I have given no instructions which have not been proved by myself and found to answer well, and I have made over 300 pipes of all sizes in paper. As regards the length of your trial pipe, you will find it distinctly stated on page 25 that it is to be cut down until it speaks rather too sharp a note, and as yours is a tone flat it is plain that it is too long. On page 27 you will find that the lengths are given as "approximate," but that word should have been placed over the colomns showing the lengths both of the shortest and longest pipes. It is impossible and inadvisable to give scales that would show the speaking lengths exactly, as the smallest error in the diameters would throw them out. A small scaled pipe would be slightly longer than a large scaled one to speak the same note, and it is always the rule to make pipes longer than the true speaking length, to allow for trimming down. The pitch of a pipe rises with increased pressure of wind, consequently wood pipes should not be cut down until tested on their own sound-board with the proper pressure. In the paper pipes it does not matter if they are a little too short, as they can be lengthened by the tuning piece. As regards huskiness, perhaps you have not trimmed off the little piece on each side of the mouth to make it level with the ears, or you may have left burrs in the voicing. The voicing should be diagonal. With regard to the stopt pipe, as you say it sounds well as an open one, it is clear that the upper lip is too far in, it should project beyond the front of the windway as shown in Fig. 15. Take the upper lip off and place a piece of stout cardboard under it and then bind it on, but do not let the card come right to the bottom of the lip. I think you will find the pipe will then sound properly, but you must not expect it to be nearly so loud as an open one. All pipes, both open and stopt, except the largest ones, should sound well by only gently blowing into them. The ears make a great difference in the fulness of the tone, especially in a stopt pipe.

C. T. H. (*Retford*) is thanked for his suggestion in reference to supplying drawings to scale for the different portions of the organ, but he will find that his desires are already anticipated. The articles on this subject will be the most complete, both in this respect and as regards the general requirements of amateurs that have ever been published for their use.

A. W. (*Croydon*).—If you have read the articles carefully you would have understood that the reason the channels at the right hand of the sound-board are larger than the centre ones is, because some of the bass pipes stand on the right hand of the organ. The small channels are for the treble pipes, which do not require so much wind as large ones. If you have not made the sound-board yet, I strongly advise you to follow the directions which will be given in an early Part.

J. B. (*Tyldesley*) writes,—I have read your articles and notes on organ building with much interest, and if it will interest you or any of my fellow-readers, I may inform you that I have almost completed an addition to my harmonium of sixty-one pipes, or the whole compass of the manual. The pipes are all made from cardboard, such as collar boxes, umbrella boxes, etc., which I get from the drapers, and in the absence of a scale I made them as best I could, starting with the smallest ones first. The double C comes out 30 in. long and 3 in. square, gives an 8 foot tone. They are all made on the common whistle principle, and the tones are all that could be desired, the upper notes are quite fluty, and the middle ones round and full, and have not yet finished the lowest octave, but so far they seem mellow and deep; but I find some little difficulty in voicing these, I suppose through not knowing the rules of the true position of windway and lip, so that I have to spend some little time before I get them suitable to my ear. I have only the one bellows at present, which I seem to humour the pipes very well, but I propose to make another pair from your directions. I should have told you that they are stopped pipes, the large stoppers I have covered with sheet rubber. The ordinary forte stops of the harmonium I have arranged so as to draw the trackers off the ends of the keys, so that I can use either pipes or reeds together or separate, and as yet I find no difficulty, and the effect is very nice. My son is at this moment playing Mozart's "Gloria," and it is very pleasing. The trackers, backfalls, etc., are made from cigar boxes. The case I intend to make of red deal, and to stain it ebony and relieve with gold paint or bead, and for the front elevation I expect to get an idea from a future number, but at present I propose to have eleven dummy pipes covered with gold and blue paper, pattern enclosed. If this will interest anyone, more anon.

G. E. B.—The octave coupler will be described in due course.

Electrical Matters.

ELECTRIFED LAWYER.—Kindly accept our best thanks for your welcome letter. Both lamps display much ingenuity on the part of their designer and maker, and we are pleased to hear of your success. It is quite a pleasure to get such encouraging letters as yours, and we shall be glad to hear from you at any time. We cannot at all understand how a stench could have been given off from Dale's Granule battery. We have a large one of 8 cells, gallon size, in our laboratory, and have not once detected any unpleasant odour from it. Do not fail to ask any question that may trouble you at any future time.

CHRISTMAS. (*Gateshead*).—We do not know of any cheap good book on medical coils. See answer to A. B. (*New Dalmarnock Road*) in page 97.

G. M. P.—We are pleased to hear of your success with the Rhumkorff coil, and still more to know that you have derived some assistance from our pages. It is our intention to describe the manufacture of small dynamo electric machines when we can find space for the articles. The work may be described as ultra-amateur in its scope, and must therefore wait until after the disposal of easier subjects. We are already accused of being too far in advance of our readers.

J. J. K. S. (*Sittingbourne*).—We are sorry to hear of your failure, but at the same time think it due to your own inability to understand Mr. Edwinson's articles. For instance you complain that he has not given the quantity of wire required on the legs of the bell magnet. In page 324, he distinctly mentions three layers of wire as being required on each bobbin. Again you say that he has not mentioned the quantity of manganese required for each cell, nor the necessary thickness of each carbon. True, the exact quantity by weight is not given, because the author could not be sure of the size cell used by amateurs, and the same remark applies to the thickness of the carbon strip. It was thought best to give the general principles of construction rather than tie the amateur down to hard and fast quantities except in the proportionate parts. You also complain that he has not given the amateur "some idea of the probable cost of materials," this shows that you have not read the articles carefully, or you would not have failed to have noticed the prices and probable cost of each article as mentioned. Others have succeeded where you have failed, so do not be discouraged. Mr. Edwinson has promised a closer attention to detail in future articles on the subject, and to make amends begs to inform you that the quantity of wire on each bobbin will depend on the length and stoutness of the bobbin, probably two properly made bobbins for a 2¼ inch bell will hold from 2½ to 3 ounces of wire. The thickness of the carbon strip may be anything between ¼ inch and 1 inch, the first preferably. A pint cell will hold about ½ pound of manganese and ½ pound of broken carbon. Price of wire about 8d. or 9d. per ounce; price of manganese, 6d. per pound; broken carbon, 6d. per pound; carbon strip 5 inches by 2½ inches, 7d. The sixth article on Electric Bells fully explains most faults likely to occur; read that, and, if possible, your difficulty shall be got over, and if you still fail to make your bell ring, write again.

Suggestion for Supplement.

JOHN MARSWEEN (*Thurso*).—Many thanks for your kind suggestions and wishes. The former shall receive our best attention, and the latter are fully appreciated. Our esteemed correspondent suggests a plate of designs for wall or house decoration, such as a design for a lobby, a parlour or a staircase; and wishes to know where he can obtain stamped designs for house decoration, and at what cost? He also thinks the supplement on Stencilling—given with our June part—a very useful one to amateurs. The particulars concerning "scumbling" shall be given in due course. Have you any wrinkles to give us on the subject?

Luminous Paint.

J. V. P.—Do you mean a luminous paint such as that which was patented by the late Mr. Balmain? If so, the answer is obvious, we cannot encourage you to make a patented article, but the paint can be obtained from the proprietors of the patent, Messrs. Ihlee & Horne, *Aldermanbury, E.C.* We have heard that a paint made of calcined oyster-shells finely powdered and mixed to a paste with a little whiting and water, and also one made from sulphuret of barium or of calcium (that has been calcined in a covered crucible), has the property of luminosity in the dark after previous exposure to sunlight, but we do not know any person who has succeeded in preparing the paint. Conjurers use a solution of phosphorus in olive oil to produce luminous effects. Balmain's patent paint may be applied to glass, and almost any other substance.

Practical School for Amateurs.

WATCHDOG writes,—Seeing so many queries in "Amateurs in Council" that require a little showing how to do, instead of a deal of telling, and as an ounce of practice is certainly worth more than a pound of theory, I think that if a sufficient number of us were to combine together and pay a small fee to cover expenses, we might rent a room or workshop centrally situated, where practice might be obtained; and I would undertake to teach those parts appertaining to carpentering, or joiners, with rudiments of the allied trades of bricklaying, etc., or would find competent teachers for those trades.

Casting in Plaster of Paris.

C. E. W. (*Clapham*) writes,—In taking moulds in plaster where quickness is an advantage, there are two methods which may be employed. First, alum water, the strength of which can be varied, a saturate solution hardening plaster in about three minutes; and, second, a more economical plan (the materials always being at hand where plaster is being used) is to take a piece of hard and dry plaster, scrape to a fine powder, and use about a dessert-spoonful to a pint of water. The latter is perhaps not so rapid in its action as the alum, but is the better till one has become used to working quickly. I need scarcely add that the plaster is mixed in the usual way, allowing for rapidity in setting.

Booth's Mitre Cutting Machine.

T. P (*Cinderford*).—These can be procured by order through any ironmonger. If you find any difficulty write direct to Messrs R. Melhuish & Sons, 85 and 87, *Fetter Lane, London, E.C.*, or to Mr. Thomas J. Syer, 1, *Finsbury Street, Chiswell Street, London, E.C.*

Bookbinder's Sewing Press.

W. G. (*Scarborough*) writes,—As some readers of the bookbinding articles in AMATEUR WORK, ILLUSTRATED, may desire to make a sewing-press themselves, such as the one described in page 470, I send you a description of one I made, costing only a few pence. Take a piece of wood about 16 inches by 10 inches, and ½ inch thick. With a gouge, or key-hole saw, cut out a slot down one side, 1 inch from the edge and 3 inches from each end. (By a mistake on the part of the artist this slot is not shown in the illustrations in page 470, but should be between the two upright screws, the cords passing through to the keys underneath.) Now take two pieces of wood 10 inches long by 2 inches broad and 1 inch thick, and nail on to one side of the board at each end like battens. On the other side at each end of the slot mortise two holes to receive the upright screws. The amateur must apply to a wood-turner to turn the two screws for him, which will cost from 6d. to 1s. The size of the screws should be 12 inches long and the screw ¾ in. thick. The screw need not be turned the whole length, about 8 inches will be sufficient, the other part left square or round. Two large wooden nuts to fit the screws are also required. The screws must be tenoned tight into the holes made to receive them, and the sewing press is complete, with the exception of a cross-bar. This is merely a piece of wood of sufficient width to fit on the screws, a hole being made at either end, slightly larger than the thickness of the screws. This is then laid on the top of the nuts, in the manner shown in Fig. 17, page 470. This press will suit the amateur equally as well as one costing five or six shillings, and will take a book of any size up to royal 4to.

Storm-Glass.

J. P. F. (*Brixton*) writes,—In answer to P. D., who wishes to make a storm glass, I think were he to attempt it the result would only be labour in vain, for in not one case in a dozen can they—even the manufactured ones—be depended upon as the indicators of a coming storm or atmospheric disturbance. I cannot give him the exact parts or quantities of each ingredient, but the composition is camphor, nitre, and sal-ammoniac, partly dissolved by alcohol with water and some air; this is placed in a glass tube, corked in and sealing waxed over, and hung up either out or in doors, usually indoors, either near a window or in a passage. They are supposed to give the following indications:—*Fine weather.* The substance remains entirely at bottom of tube, and the liquid perfectly clear.—*Coming rain.* Substance will rise gradually, liquid will be very clear with a small star in motion.—*A coming storm, or very high wind.* Substance partly at top of tube, and be of a leaf-like form, liquid very heavy and in a fermenting state. These effects are noticeable twenty-four hours before the change sets in.—*In Winter.* Generally the substance lies higher in the tube.—*Snow or white frost.* Substance very white, and small stars in motion.—*Summer weather.* The substance will lie quite low. The substance will lie closer to the tube on the opposite side to the quarter from which the storm is coming. Professor Tomlinson, and Fitzroy, the inventor of a barometer bearing his name, both experimented and examined this instrument, and the results were found to be very considerable variations in the composition of the crystallisable fluid with various makers, some of the tubes not sealed at all. In proof and support of this, P. D. has only to look in the window of any optician's shop where these instruments are hanging, and there being half a dozen or more in a row, each one will give different indications to the others. Now which could he select?

Telephones.

E. A. P. (*Sunderland*).—I only mentioned insulated or covered wires because my description applied principally to telephones placed in the house, or at a short distance apart from each other. It would certainly be more economical for long distances out of doors, to use ordinary galvanized wire similar to that used by the telephone companies, but you must thoroughly insulate it, as they do, at all its supports, keeping it quite clear from roofs, gutters, or any like objects, and then there is not the slightest reason why you should not succeed even for a distance of a quarter of a mile.

G. A. M. B. (*Langham*).—Messrs. H. & E. Dale, 4, *Little Britain, London*, will supply you with No. 36 silk covered wire at 1s. per ounce, and magnets from 1s. 6d. to 3s. per pair. Mr. Edwinson has, I think, promised a paper on "Electric Motors," see page 497, last volume of AMATEUR WORK, ILLUSTRATED.

W. E. F. (*Burford*).—Your failing to send a battery current through the wire of your bobbin shows, without doubt, that the wire is broken. You must unwind it and examine carefully every part, when most likely you will discover the place by the frayed appearance of the silk. The fracture can then be easily remedied by baring and scraping the broken ends, twisting them well together, and then re-covering them with some silken thread or fine narrow ribbon. Should, however, as it sometimes happens, the fracture not show itself, the best way is to gently scrape off the silk at one or two places, and then from there test the wire each way with the battery until you have so far localized the spot to within a short piece of the wire, cut this out altogether and splice the remaining good lengths. It seems strange that both your bobbins should prove faulty in the same manner; and you must either have purchased damaged wire or else in winding it have pulled it too tight, or got it into sharp kinks. As you have a battery you should test it before winding; and are you sure that you applied the battery correctly, so that the fault does not lie there? The reel being of pasteboard in place of wood, would not make any difference.

J. C. (*Malvern*).—To connect up your two stations without any earth is by no means so complicated as you think, but since you do not employ the earth to conduct your current, you must have a second line wire in its place. The two wires can be laid along side one another, being of course insulated, and for indoor work you can obtain from Messrs. Dale, at 1d. per yard, both the wires insulated from each other, but woven together, to all appearance like one wire. To connect up, join the two ends of the one wire to the bell and battery switches, as shown in Fig. 15, page 494, Volume I., and to the ends of the second wire, which is to take the place of your gas or water-pipes; join up direct the three wires of each station leading from the bell, the telephone and the battery zinc—that is to say, the wires leading to the gas-pipe marked K in the same figure.

Roger's Fret-Saw Machine.

W. R. C. (*Southsea*) writes,—Referring to No. 5, AMATEUR WORK, ILLUSTRATED, page 242, in reply to the query of your correspondent (D. K., *Liverpool*), I beg to offer my testimony with regard to the American Roger's Fret Machine. I have now had one in use for nearly two years, during which time I have, of course, done a great deal of work with it, but I must confess not without a great deal of trouble with the machine. Probably it is from the fact of my not having seen another treadle machine at work, but I should think twice before I parted with this machine for another of a different description; and now, about my troubles, they arose mainly from the fact that two or three of the working parts were very weak, to give them in detail will perhaps occupy more of your very valuable space if I were to fully particularise them. I will briefly give them: first, in the lower arm of the frame there is an eccentric which works in the wood, instead of this I had a small casting made which reduces the friction to a minimum; in the next place, the arrangement at the back of the frame which is used for the purpose of lightening the jaws, was very faulty, and this I have had altered according to my own idea, and since its alteration I must say that I have not found any trouble in that direction. In conclusion, I would advise all using this machine to buy "Griffin's Patent Fret-saw Blades," instead of the common ones now in use, and in this respect they would find a very great difference not only in the quantity of work done but also in the quality. Should it be of any advantage I may add that I have not used any other sort for nearly twelve months, and were I unable to procure any more I unhesitatingly say that I should leave off fret working as a pleasure.

Doll's House.

J. H. (*Blackpool*).—I regret very much that you and your friends have been kept waiting. As soon as the promised article and illustrations reach me they shall appear. I can name no definite time.

J. F. (*Goodge Street, W.*).—See preceding reply.

Home-Made Furniture.

D. W. (*Clydach*).—Write again to the firm you mention for their catalogue. There will be nothing in the way of Home-Made Furniture left untouched in AMATEUR WORK, ILLUSTRATED. You will find the articles on Decorative Carpentry useful and suggestive.

Harmonium Building.

R. H. (*Islington*).—In the reply given to you on this subject it was stated that "the spring for the reservoir may be *half* a chair spring," whereas it should read "a *whole* chair spring."

Boat Building Made Easy.

(*Erratum*).—In Fig. 19 (Norwegian Fishing Boat) the divisions between the side boards should, of course, be continued to the extreme front. The stem-piece is not fastened to the ends of these boards; they embrace it. The mistake can easily be remedied with a fine pen.

H. S. (*St. Catherine's*).—(1) The side planks are nailed on the stem and stern-pieces. Fig. 19 is wrong, in not having the divisions between the planks continued to the very front of the boat. (2) If the gunwales are used for laying on the floor under the sections, for which I say they will answer very well, it is plain it is only temporarily. Any stiff pieces of wood will do, and, as I say on p. 485, probably it would be well to have these deeper than the gunwales. (3 and 4) Full directions are given for cutting beds for the keel-board in the stem and stern-pieces; for fastening the keel plank into these beds; for fastening the edges of the bottom pair of planks outside the edges of the keel plank; for filling the space between the edges of the bottom pair of planks with tar; and, lastly, for nailing on an outside keel plank, which should of course be the same thickness as the others. (5) The same beam will do for a 12-foot boat, but it will be needlessly broad. (6) I cannot advise you about the linseed oil and Archangel tar. Any painter should be able to tell you.

Mounting Maps.

L. H. (*Limerick*).—An article on this subject from the pen of Mr. John Brion, Constructor of Relievo Maps to H.R.H. the late Prince Consort, will appear shortly.

Removing Stains from Marble.

D. H. (*Rio de Janeiro*).—To remove stains take of soda two parts, powdered pumice stone, one part, and powdered chalk, one part. Rub these ingredients well together in a mortar, sift through a very fine sieve, and mix the powder obtained into a paste with water. Rub well all over the marble, and then wash with soap and water, or mix strong soap lees with quick lime to the consistence of thin cream. Spread the mixture over the marble and after the lapse of twenty-four hours wash with soap and water. This will remove stains and restore the colour,

Sale and Exchange Sheet.

C. Y. (*Regent Street*).—You will have seen from Part XII. that your request has been practically complied with. The rate of charges for notices you will find in the "Rules and General Directions."

American Bronze.

J. T. F. (*Brixton*), in accordance with the suggestion made in my notice of this material in "Notes on Novelties," wrote to Messrs. B. F. Brown & Co., of 18 and 20, *Norman's Buildings, St. Luke's*, to ask the price per bottle. It appears from their reply to J. T. F., that Messrs. Brown & Co. only do a wholesale trade, and do not supply the public either by post or parcel, and they further state that the applicant may "obtain the bronze through his chemist or bootmaker, and will cost him about 1s. to 1s. 6d." Everybody knows his own business best, without doubt, and Messrs. B. F. Brown and Co., must follow the bent of their own peculiar inclinations. As the price was not stated on the specimen sent to me, the best thing that I could do in the interest both of Messrs. B. F. Brown & Co., and the readers of this magazine, was to say as I did, "I am unable to state the price per bottle, which I regret, as the preparation is clearly a most useful one, but a post card to Messrs. B. F. Brown & Co., whose address I have given, will soon elicit the desired information." In their reply to J. T. F. these gentlemen write: "We beg to say the notice in AMATEUR WORK, ILLUSTRATED, being inserted without being submitted to us, otherwise it would not have stated that we could send same through post." I daresay my readers will comprehend Messrs. B. F. Brown & Co.'s meaning, despite the haze of the expression that envelopes the whole sentence which I have given *verbatim*. What I said was that the Bronze *could* be sent by post, "as it is supplied in a tightly-corked wide-mouthed bottle, which is enclosed in a neat case." I may add now that I never *submit* my notices of articles to any makers or sellers of the same, whether wholesale or retail, and, further, that I do not think it will advance the sale of any preparation to send it out *without price*, and leave it to the retail dealer to ask just what he pleases for it. It *may* be to the advantage of Messrs. B. F. Brown & Co. to do so, and it certainly *must* be to the advantage of the retail dealers to sell on these terms, inasmuch as they can ask just what they please; but buyers will assuredly be somewhat astonished if they find themselves charged 1s. at one shop and 1s. 6d. at another (only 50 per cent difference!) for one and the same article.

Building Greenhouses, etc.

J. T. F. (*Brixton*).—Your valuable contributions and suggestions shall appear together in the form of a paper. I am glad to receive any thing from your pen, but could not you put your communications in the form of articles ready for the printers? It takes time to put them into shape, and hence the delay which I fear is as disappointing and annoying to you as it is unsatisfactory to me.

Marquetry Work, etc.

IMPROVER.—Instructions on this kind of work, as well as on Parquetry, Buhl-work, etc., will be given in due course in this Magazine. As a practical and professional carpenter, you should provide yourself with such books as Tredgold and Hurst's "Carpentry," published by Spon. You will also find many books in "Weale's Rudimentary and Scientific Series," published by Messrs. Crosby Lockwood & Co., that will help you. I know of no professional works on the subjects you mention. I think if you look again at our articles on woodwork, that the fitting material to use is generally, if not always, mentioned. It would not answer to keep butterflies and moths in such a combined aquarium and fernery as you mention, the poor insects would soon worry themselves to death, beating against the glass, in trying to regain their liberty.

Picture-Frame Making.

HARRY.—Articles on this subject have been received, and will appear very shortly

Pianoforte Making.

J.W. (*Nottingham*).—Articles will he given in due time on this subject, from which you may learn how to construct this instrument. The iron framework that you have made for supports at back and for the strings, weighing three hundredweight, is unnecessarily heavy and cumbrous.

Drilling Holes in Glass.

A. BOYLE.—Holes for ventilation in a bell glass for covering ferns may be bored with a drill. Messrs. Churchill & Co., *Cross Street, Finsbury*, or any ironmonger, will supply you with one suitable for the purpose; or you may get the holes pierced by any one who mends broken china and glass.

Gilding Picture Frames.

A. B. C. (*Staffordshire*).—A contributor to this Magazine is engaged on articles on this subject, which will appear in due time. Instructions for bronzing a plaster cast will also be given.

VIGILANS.—See preceding reply.

Printing for Amateurs.

NOEL.—You will see that a series of papers on this subject is commenced in this Part, and from these papers and the advertisements that appear from time to time in the Magazine, you will gather all necessary information with regard to the *modus operandi*, and the apparatus and the appliances required. The "Trypograph," about which you ask, is also noticed in "Notes and Novelties" in this Part. It is a most useful apparatus, and if you are inclined to try it you would find it most helpful for the purposes of which you speak in connection with your missionary work in India, in which I need hardly say I wish you God speed. You can reproduce and multiply copies of any written document, both easily and quickly, by the aid of the Trypograph.

Painting Door Panels, etc.

W. B. (*Ballinamona*).—Many old pictures of great value are painted on panels. These, however, are for the most part but small, and for many years panels have been superseded by prepared mill-boards. The paint now on the panels should be cleared off with Rendle's Electric Paint Remover, and a perfectly smooth surface produced with glass paper. A suitable ground tint should then be applied, on which the design may be painted. The colours, varnish, and appliances to be used are those which are sold by any artists' colourman for painting in oil colours.

Optical Instruments.

A. B. (*New Dalmarnock Road*).—A gentleman offered to supply instructions on making Telescopes, Microscopes, etc., but I have heard nothing from him since his proposals were accepted. A paper on the method of making a small medical coil will appear shortly, and I have good hopes that arrangements will soon be completed for papers giving instruction in smith's work and metal working for amateurs.

Substitute for Reed Plane.

W. S. (*Beith*) is thanked for his communication on this subject, which will appear in the next Part of AMATEUR WORK, ILLUSTRATED.

Amateur Work.

C. E. H. (*Swaffham*).—Thank you for your good opinion of the Magazine. Your suggestion shall be carefully considered and acted upon, as far as it is possible to do so; but some ask for working drawings, full size, of bookcases and other large articles, declaring that they cannot read drawings to scale!

Bicycles v. Tricycles.

A Constant Reader.—The writer of the papers on "Velocipedes" thinks that as tricycles are certainly safer, and therefore more desirable than bicycles, that attention should first be paid to these as a means of locomotion. After the method of building a tricycle has been explained bicycle making shall be taken up.

Block Planes.

W. B. (*Barnsbury Road*).—Your query has been submitted to Messrs. Churchill and Co., and shall be answered in the next Part.

Coach Building.

R. R. L. (*Rathmines*).—I had an offer of articles on this subject, which was duly accepted; but, as in other cases, I have heard nothing whatever from the intending contributor since. I shall be glad to entertain further proposals on this subject from competent persons.

Dining Table.

R. R. (*Taunton*).—I fail to understand from your letter if you wish for instructions on making a dining table, or propose to write an article on the subject. If the latter I shall be glad. You can advertise your lathe for sale in the "Sale, Purchase, and Exchange Sheet."

Bookbinding.

W. C. (*Alfreton*) has certainly not read page 471 correctly Each sheet, although sewn as one for the time being, forms only part or section of the entire book. The thread must be continuous from the first to the last sheet, joining a new thread as the last or old one is expended. Please read page 471 more closely, and if not understood let me know again. Instructions for binding first vol. of Amateur Work will be given in next paper.

Coal Vase in Oak.

W. F. S. (*Leicester*).—Your letter has been sent to the writer of the papers on "The Restoration of Antique Furniture," with a request that he will furnish designs. What are the dimensions of your panels?

Photography.

R. P. (*Cornwall*).—Judging from your letter, I should say dry plates would suit you better than the wet process with these plates; the development is deepened till the operator returns home; but if R. P. will forward his address, I will send him sketch for a changing box and dark tent combined, suitable for dry plates. Double dark slides are generally used, and six of these slides carry twelve plates, enough for an ordinary day's work. A half-plate lens will not produce a whole-plate negative, although a whole-plate camera is used, any more than a cannon-ball will fit a pistol. But it often happens that the back combination of a lens will take, or rather cover a much larger plate by itself, than if used as sent out by the maker. The focus will be longer, often twice the length, as when combined, and a much smaller stop will have to be used. The two above reasons will point to the fact that the exposure will have to be prolonged.

If you write to any of the firms whose advertisements appear in the advertising pages of this Magazine, or have been mentioned in the articles on "Photography" and "Notes on Novelties," you would doubtless receive at once some photos, both grateful and pleasing as studies for you to endeavour to repeat.

Old Coin.

A. L. D. (*Dublin*), in reply to W. M. on this subject, says that he had a similar coin in his possession some time ago, with a large ship on one side of it, and that he could make out on it the words "Liverpool Halfpenny," and the figure 17, part of the date.

Bombex writes in answer to W. M. (*Manningham*):—The coin named is most likely a "halfpenny token"—probably a Liverpool token—as coins of this nature were current in this town at the beginning of present century—especially with a ship on one side of the coin. Many "tokens" were in use in Liverpool at the time named, the chief part of them being issued by well-to-do shopkeepers, storekeepers, and others, who changed them for silver. The issue also acted, and that very efficiently, as an advertisement.

B. S. thinks than W. M.'s coin is a New Brunswick halfpenny token.

Brown Stain for Wood.

An Art Student writes:—For brown stain use permanganate of potash; an ounce costs less than sixpence, and makes a quart of stain. Plain boiling water is poured on it. It may be varnished, and afterwards polished with beeswax and turpentine. I have used it, and find it answers well. An old brush should be used, as the brush is quite spoilt for further use.

Looking Glass for Cabinets.

A. M. A. writes:—I have often been supplied most satisfactorily with "patent glass," suitable for small articles, painted on the under side, cut, while I waited, any size, at the rate of 1s. per square foot, at Farmeloes' glass manufactory, *Rochester Row, Westminster*.

Continuance of "Amateur Work, Illustrated."

E. G. H.—See prospectus for Vol. II. of Amateur Work, Illustrated, issued with Part XI. This magazine will be continued from month to month and from year to year, as long as any demand for it exists.

Copying Letters.

S. S. (*Tewkesbury*).—Your request with regard to furniture that may be made at home shall receive attention. For *copying letters* you must write with copying ink and use the ordinary copying press, but for the reproduction and multiplication of written documents, you may use one of the "Graphs" or the "Trypograph," manufactured and sold by Messrs. Zuccato and Wolff, 15, *Charterhouse Street, Holborn Viaduct, E.C.*, and described in "Notes on Novelties" in this Part.

Hints to Bicyclists.

B. S. (*South Hampstead*) writes in reference to the above subject:—I think Mr. Fitton's remarks as to the straightening of a buckled wheel are likely to make a bicyclist diffident of trying to strengthen one unless he has three more to help him, while I know from personal experience that it may be easily straightened by *two*.

Gas Making at Home.

W. M. B. (*Winterbourne-Monkton*).—An inquiry shall be made on the subject of the advertisement sent, and if the invention appears to be useful, a notice of it shall be given. The cost of the gas, however, is 4s. 6d. per thousand, which is above the rates charged by most gas companies.

Polishing Marble.

A. B. (*Shirlock Road, Kentish Town*).—The slab must be laid flat, and first ground smooth with sand and water, by means of a flat piece of stone. The actual polish must be given with a composition sold as "putty powder" (its chief ingredient, we believe, fine emery). A piece of wood, over which has been stretched an extremely thick felt, sold for the purpose, is used for rubbing the preparation on the face of the marble. The addition of a little salt of sorrel (oxalate of potash) brings the polish more quickly, but must be used with caution on black or coloured marbles. A. B. will find polishing marble a fine field in which to exercise the virtue of patience.

Information Wanted.

Country Bod asks:—How shall I construct a *Model Electric Railway* not to exceed 1 foot in length, to carry battery, if possible, in same space, to be worked with bichromate-of-potash cells?

W. J. (*Bristol*) wishes for a receipt for *bleaching coral*. He has a piece that is very dirty, and apparently wishes to clean it.

K. J. T. (*Longtown*) writes:—Having to make a *cradle*, I should be much obliged to any correspondent of Amateur Work, Illustrated, who could give an idea *how to make it go, either with clockwork or springs*, or to work as a crib without rockers, and to be a little distance off the ground.

D. H. (*Rio de Janeiro*) writes:—I wish, if possible, to construct an *artificial incubator* for raising poultry, but never having seen one, or even a description of one, I am at a loss how to proceed. Perhaps some of my fellow-exiles would welcome a plain description, giving all necessary details as to means of heating, regulation and temperature. [This is a matter which deserves attention, and on which I shall be glad to receive papers and communications.—Ed.]

T. L. M. C. (*Kilkenny*) wishes to know the price at which a *phonograph* can be purchased and seeks instructions for making one. The method of making *an instantaneous shutter for camera* will be described in an early Part.

C. L. (*Aden*) wishes for some instructions in *working amber*. He desires to reduce a mouthpiece for a pipe, which is too thick, but fears to remove the polished surface.

Etching wishes to know how he can *frost*, i.e., *engrave wine glasses and tumblers* to resemble ground glass, and produce a monogram on them about the size of a postage stamp.

WOOD-WORKING MACHINERY FOR AMATEURS.

By A. W. J. TAYLER, C.E.

VI.—PLANING MACHINES.

HAVING converted his timber, by means of a circular or other saw, the amateur will have to perform the operation of planing, moulding, etc. This may, of course, be performed by means of hand-planes. There are a great number of planes, all of which are distinguished by different names, amongst others may be mentioned moulding-planes, for producing ornamental mouldings; rebating-planes, for forming rebates; the straight block, for straightening edges; bench-planes, such as, the jack-plane, trying-plane, shooting-plane, long-plane, and smoothing-plane. The jack-plane is used for taking the roughest and most prominent parts off the surface of the wood, the trying plane is longer than the jack-plane, and it has two handles, the shooting-plane is the longest and truest plane in use.

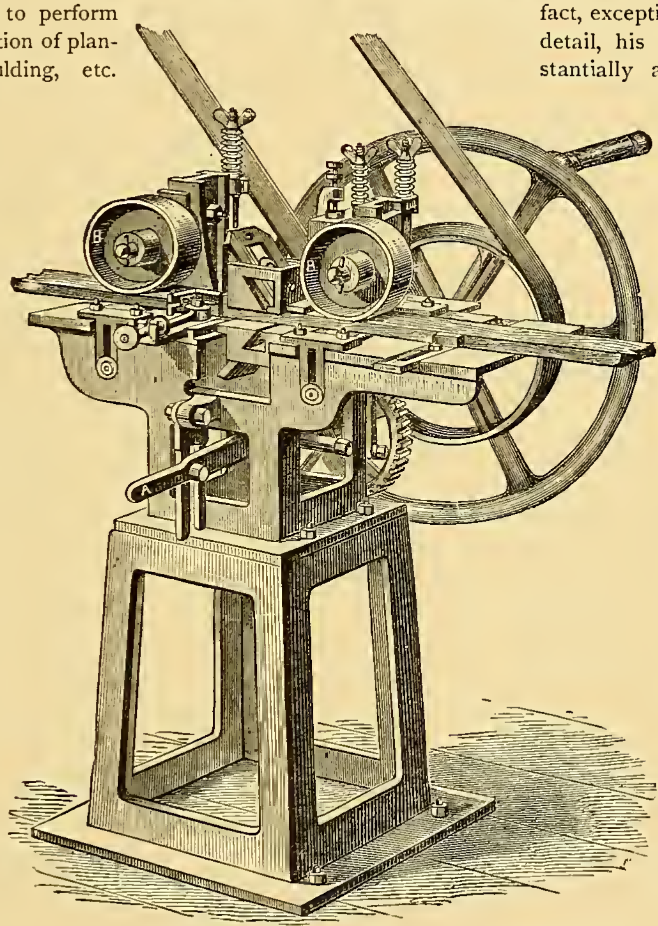


FIG. 27.—SHILL'S PATENT HAND OR STEAM-POWER PLANING MACHINE.

The operation of planing by hand-planes is one of the slowest and most tedious possible; it is not therefore surprising that a great amount of talent and ingenuity has been expended upon the construction of steam planing and moulding machines, and that the work turned out by them with astonishing rapidity far exceeds in quality anything that can be done by hand-planes. The first planing machine on record was the one patented by Sir Samuel Bentham in 1791, it was intended to work by hand-power; it did not, however, owing to some defects in construction, come into general use, it had a fixed cutter the full length of the board to be planed, and the great advantage claimed for it was the mode of adjusting the plane-iron, which could be performed by any one, thus obviating the necessity of skilled labour. In a subsequent patent (1793) Sir Samuel Bentham claims the idea of adapting rotative motion of a tool, to give all sorts of substances any shape that may be required, in fact, excepting the improvement in detail, his patent contained substantially all the features of the improved machine of the present day. We have not space here to go into all the subsequent patents taken out for improvements by Bramah and others; and if the reader has any further curiosity upon the subject, we must again refer him to the work already mentioned, in which he will find the subject gone into at length.

If the amateur intended to use either a small steam or gas engine, there are a great variety of small planing and moulding machines requiring comparatively small power to drive, but which cannot be driven by hand-power on account of the great speed at which it is necessary that rotary cutters should revolve; and as we are describing machines that can be worked by hand-power, we have not much choice in planing machines—in fact, so far as we are acquainted, there is but one machine adapted to work by hand-power, at least in this country.

Fig. 27 illustrates Shill's patent hand or steam-power planing machine. It is especially adapted for light work, such as cabinet, pianoforte, and organ building, etc. As the work is performed by a series of fixed or hand-plane cutters, the cutting action is not dependent on the high rate of speed at which the machine is

driven, as is the case in machines with revolving or rotary cutters, thus enabling the machine to be driven either by hand-power or steam, as desired, and rendering it particularly suitable for an amateur. It will plane all four sides of the work simultaneously or singly, as may be desired, and the planes being fixed, when once the machine is set, will plane any number of pieces to exactly the same gauge, no variation being possible. The cutter for planing the under side of the wood is fitted into an adjustable drawer arranged in the table of the machine, the top cutter which planes the upper surface of the wood, is fitted into a block so arranged that it readily adjusts itself to the varying thicknesses of the stuff being planed, during operation. One of the side cutters, that plane the edges of the wood, is fitted in the guide, whilst the other is so arranged, by means of a spring, that it is automatically adjustable to varying widths of wood. The wood to be planed is fed by means of two sets of rollers which grip it tight, and are driven by gear from the motive-power, passing it rapidly between the fixed planes; these rollers are adjusted to varying thicknesses by means of the hand-wheel on the top of the machine, the top plane is also adjusted by the same means, the necessary pressure of the plane upon the wood being regulated by the hand-wheel on the side of the machine, the plane-irons can be taken out for inspection in an instant, without removing any of the other parts. This machine will, it is stated by the inventor, plane wood at the rate of about one hundred and fifty feet per minute when working by hand, or three hundred feet per minute when driven by steam. The price of the smaller machine, especially adapted to work by hand-power, to plane stuff 3½ inches wide by 1½ inches thick, is £45.

In using a machine of this description the great point to be attended to is the proper sharpening of the plane-irons, the cutting edge should be arranged at a slightly oblique angle to the wood, thus considerably reducing the shock upon the knife, the general tendency of all fixed cutters being to splinter the wood, the absence of this tendency is one of the advantages of rotary cutters.

Shill's patent hand or steam-power wood planing machine may be obtained from Messrs. Middleton & Co., *Loman Street, S.E.*

[The want of a machine for performing the laborious operation of planing rough surfaces is one that has long been felt by amateurs, and only a few weeks ago the following appeal to engineers to turn their attention to a contrivance for planing, which should supersede the use of the jack-plane and smoothing-plane appeared in the *Timber Trades' Journal.* It is reproduced here, because it is a fair expression of the desire of a very large class of amateur wood-workers, who, for want of time, or for want of skill, or in the case of the writer, a latent dislike to hard work, object altogether to planing. His letter runs as follows:

"I see in your paper a number of advertisements, by celebrated inventors, of tools and machines for saving labour in the conversion and adaptation of wood to every purpose under the sun, and yet it seems to me that there is still room for a new invention, and that a tool is wanted which every amateur who has not a regular workshop with bench and fittings complete feels the want of as often as he sets about a little domestic job of carpentry, though it were only to put up a shelf in the pantry or make a mignonette box for his study window.

"We do not like planing. By we, I mean that numerous class of unskilled artisans who sometimes work very hard at play—at cricket, for instance—and then play at work by way of relief and recreation. We can cross-cut thin boards with our hand-saw, make tolerable mortises with chisel and mallet, let in hinges, use gimlets and bradawls with some dexterity, and drive screws and nails to an unlimited extent. But, as aforesaid, we do not like planing when it becomes necessary to deal with the broad side of a rough board. This is laborious work, requiring the strength and skill of a practised workman; and if there be any hard knots in your way, as not unfrequently happens, or a hidden nail or two, the instrument is liable to be put out of order, and much time is lost in re-sharpening and adjusting it. I never find myself in this predicament, but it occurs to me that some implement has yet to be brought to light which shall render the work of preparing a rough board to receive paint with much less hand labour than has now to be applied to it, where the motive-power consists only of the thews and sinews of a single individual.

"Between the ordinary hand-plane, which cuts away too much, and glass paper, which is too fragile, there is a vacuum; what is wanting, and seems to be quite within the limits of possibility, is an instrument combining the merits of both—something weighty, like a flat iron, so prepared on its under side as to render it effective to smooth a board on being moved about over its surface with little more pressure than that of its own weight. Will no one invent such an implement for us incapables?"

Thus far one of the "incapables," whose incapability clearly proceeds from a sinister combination of wan of skill, lack of perseverance, and an evident leaning to, and liking for, *dolce far niente.* His want, and that of many others, if it were a matter of Hobson's choice with respect to Shill's small machine for planing, would perforce remain unsatisfied, for there can be but very few who would, or could lay out £45 for the purpose of planing a piece of wood 3½ inches wide by 1½ inches

thick. It has been truly said, however, that "hope springs eternal in the human breast," and although amateur wood-workers in general have been for some years hoping against hope for a cheap and efficient planing machine, their natural desire is one that is likely to ripen quickly into the joy of possession, for there is reasonable expectation that in an early part of this magazine the difficulty will be fully solved and set at rest for ever.—ED.]

VIOLIN-MAKING: AS IT WAS, AND IS.

By EDWARD HERON-ALLEN.

XII.—THE MODERN BOW: HOW TO MAKE IT.

MODERN BOW.—Fig. 123 represents the modern form of bow, as finally determined by Tourte, jun., in its entirety, and Figs. 124 and 125 represent the head and nut, actual size, and Fig. 126, one of the wedge-boxes enlarged. Fig. 124 represents the nut and screw as set on the stick of the bow. In the nut is a small box (represented by Fig. 126), into which the knot M of the hair (Fig. 127) is fixed by means of the wedge N. The hair L being brought out and along the front of the nut E, the ornamental plate H I J is slid ove it along a mortised groove. The band K is then pressed into its place and fixed by the pressure of the thin wedge O, which being pressed in between the tongue of the nut E, and the hair L, keeps the latter flat, firm, and fast. The entire nut E slides along the stick A by the action of the screw B C; the surface which lies against the stick is cut angularly (as in G, Fig. 124), the cutting G being often lined, as in the illustration, with a thin bent plate of metal. The hair L leaving the nut E passes in a ribbon about $\frac{1}{2}$ an inch broad to the head, where it is in a like manner fixed into a similar wedge-box, Fig. 125. The face of the head is generally protected by means of a metal or ivory plate, P. The length of the bow is generally as near as possible 20 inches inclusive, the diameter of the stick is, at the screw (D, Fig. 123) $\frac{3}{8}$-inch, at the back of the head $\frac{3}{16}$. The diameter of the head across the plate (P, Fig. 125) is $\frac{7}{16}$, and the length of the head from top to bottom of P is one inch. The hair with which the bows are fitted (which is horse, and not as some people imagine, yak) is sold by the pound, and as I noticed before, in discussing Tourte's bow, it must be very carefully chosen and cleaned. It is also customary to lap or cover the sticks of bows for a space of a few inches above the nut, with gold or silver thread or leather. This is doubtless a great convenience in holding the bow; it was for the same purpose that the elder Tourte, and some of the old bow makers, used to flute their stick over half or throughout their length, often in a most exquisite manner.

To Hair or Re-hair a Bow.—If the latter, you must first unhair it; commence by cutting the hair off short at the nut, then lifting the hair up pick the wedge N, Fig. 126, out of the head wedge-box and pull out the knot M. Then take off the band K, Fig. 124, first pulling out the wedge O. Draw off the plate H I J, lift up the ends of the hair L, Fig. 126, pick the wedge N, Fig. 126, out of the nut wedge-box and pull out the knot M. The stick is now clear of hair, wedges, and all, as if it had never been haired, and you can now proceed to hair it. The hair should either be kept in a large coil tied together loosely at one end, or straight out, wrapped round with paper in a drawer, the latter mode being the best. Lay out the bundle of hair on the bench and place a heavy weight on it. Then take out enough for the bow, pulling it out from the bundle so as not to entangle the rest. You will be able to judge the quantity required by the eye after you have done this operation once or twice. Take some waxed silk and tie round one end as at M, Fig. 127, and cut off the ends just beyond it; hold these ends with a little stick of clear rosin in the flame of a spirit lamp for a few moments, so that the melted rosin permeates the ends and knot M, so as to harden and secure it. Take care not to burn off the waxed silk and burn too long doing this, or you will have all your trouble over again. Now cut a wedge (N in Figs. 124, 125, 126) of such a size that it fixes the hair tight into the wedge-box in the head, the top of the wedge being just even with the plate P, so that the hair comes from it flat over the plate P. Put the knot M into the wedge-box, flatten out the hair so that it leaves the head in a broad ribbon, and hammer in the wedge N so as to keep it thus, and as far as the head is concerned the hair is fixed. Now comb out the hair throughout its length, and then coiling it up near the head, steep it for a few moments in tepid water. Then hold it at the nut and recomb it from top to bottom over and over again till it is quite free, flat, and firm. The nut must be set as in Fig. 124, with the eye D in the middle of the groove cut in the stick to receive it, or if anything rather towards the head. In this manner, holding the band of hair in your fingers, and allowing for the knot to curl round the wedge in the box, make a tie and rosin the cut ends as at Fig. 127, in the same way as you did when preparing to set the other end in the head. Now take the band K off E and slip it (right way up) over the hair, so that it can be brought back over the end of the nut when the hair is fixed, and taking E off the stick by completely unscrewing B, draw off the slide H I J, and fix the knot

into the wedge-box as at Fig. 126, exactly as you fixed the other end into the head.

Now replace the nut E on the stick, by means of the screw B, and if you have nicely judged the length of the hair before making the tie M, the hair will be quite slack when D is as far forward in the groove as possible, and per contra much too taut when it is drawn as near as possible to B, the proper tension of the hair being when D is in the centre of the groove as in Fig. 124. However, if the bow can be made slack, and tightened up by means of B, your work has been well done. Now finally comb the hair from head to nut, replace the slide H I J, and pull down the band K, which is threaded loosely on the hair, and slip it over J into its place. Now screwing the bow pretty tight, take the smooth *back* of the comb, and rub the surface of the ribbon of hair hard from the head to nut and back a few times. Then cut a little flat wedge O, or if necessary, two, to slip in, and fill up the space between the ebony of the nut inside, K, and the under side of the hair, which will keep the ribbon of hair tight and flat against J, and the flat side of K, and the operation of hairing the bow is complete. Now take some very finely powdered rosin, and sprinkling it on a sheet of paper, rub the hair on it so as to get well dusted and covered with rosin, this, as it were, gives it a start, after which it is easy to keep the bow resined.

As I said in the chapter on fittings and appliances, it is as well not to make changes in the kind of rosin one uses, except when the bow is rehaired, from which time one kind must be kept to, till the next rehairing, and so on. It is a great mistake to use too much rosin, as young beginners are often apt to do, it is only productive of a loud coarse tone; and I prefer, personally, to err on the side of too little rosin, rather than to burden my bow and rasp my fiddle with too much. It is astonishing how few violinists know anything about the mechanical and scientific action of powdered rosin on tone production. Many people when they see you applying rosin, think you are "greasing your bow to make it go faster," and more still, including performers themselves, think that rosin renders the surface of the hair smoother, instead of as it really does, making it rough. They know that if no rosin is used, the bow will make no sound but *voila tout.*

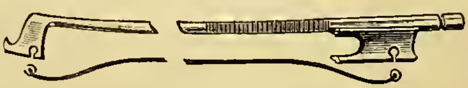


FIG. 128.—SELF-HAIRING BOW (GEORGE WITHERS).

The true function of rosin is as follows: It will have been noticed that whilst a string is vibrating, the least touch of the finger will make it instantly cease; why, therefore, does not the continuous pressure of the bow, militate against the production of sound? Answer: Because it is *not* continuous, owing to the presence of the rosin. If the bow were quite free from rosin, so long as it touched the string, or were drawn across it, the contact would be perfect and continuous, and as a natural result the existence of vibrations would be rendered impossible. When, however, the smooth surface of the horsehair is roughened by infinitesimal particles of rosin, the bow does not touch the string with a continuous pressure, but owing to the presence of the rosin, the string receives a constant, though infinitesimally intermittent succession of shocks, which renders the succession of vibrations so rapid as to appear continuous. It would take too long to discuss the scientific principles involved by this simple phenomenon, but the above exposition will show that the bow and hair are both secondary in importance, the true magical power of them both, lying in the obscure and unnoticed rosin. Wherever bow instruments are used, rosin is an invariable adjunct. Among primitive bow instruments, such as the urheen of the Chinese, and the ravanastron of the aboriginal Hindu, the rosin is always found in a little dirty lump, stuck on the top of the cylinder which bears the skin, which serves as the sound board of those harmonious instruments. In the urheen especially, which has but two strings, and whose bow is worked *between* them, the convenience of this primitive arrangement is obvious, for with a couple of rubs the performer can rosin his bow during a half-bar's rest in his performance. Paganini is said to have played exquisitely on his violin with a rush, with a view to annihilating a self-confident Italian amateur, who matched himself against the "Immortal Trickster." If you gather a common rush, you will find that its surface is quite rough enough to have the mechanical effect of powdered rosin, which accounts for the above performance.

FIG. 123. MODERN BOW, AFTER TOURTE.

Like the violin, the bow has been subjected to manifold improvements, and has survived them all in its absolute simplicity, as determined by Tourte. Amongst the most striking of these is the folding bow, made to go with the folding violin, mentioned in the last chapter. It comes in half with a joint, like a fishing rod, and curiously enough, does not seem to be seriously affected by this eccentricity of construction. The late J. B. Vuillaume introduced steel bows, but I have never come

across any specimen of so ponderous an eccentricity, other than the one in the South Kensington Museum. One introduction, however, of his which has survived, is his self-hairing bow, which has reached us in the form of Mr. George Withers' self-hairing bow, which is reproduced by his permission in Fig. 128. The head, it will be seen, has no face-plate (P, Fig. 125), and though the nut and screw work in the usual manner, the nut is a plain piece of ebony (*i.e.*, it has no wedge-box, slide, etc.) The hair for these bows is sold in the right lengths, being terminated at each end by small cylindrical pieces, which slip into two holes cut in the head and nut, as in the illustration, to receive them. It will be observed that though absolutely identical in every respect with the ordinary forms, not a particle of glue is employed at any point of the bow, and those who have ever taken a fiddle and bow through the Canal to India will fully appreciate the boon here conferred upon them. In M. Vuillaume's original form the hair fitted in a precisely similar manner, but the nut was glued fast and immovably to the stick, the hair was fitted to a smaller brass nut which by means of the screw worked backwards and forwards inside the larger ebony one. The advantage claimed was that the distance between the nut and head (and consequently the length of the hair) never varied.

Mr. Bishop in his most valuable appendix to his translation of "Otto on the Violin" (which, with his notes on the text, constitute the great and sole value of the work) asserts that the variations of the movable nut are calculated to affect the tone of the performer. Mr. Bishop of course speaks *ex cathedra*; but, personally, I do not consider the infinitesimal advance and retreat of the nut, to suit various styles of playing, to be in any way detrimental to execution on the instrument.

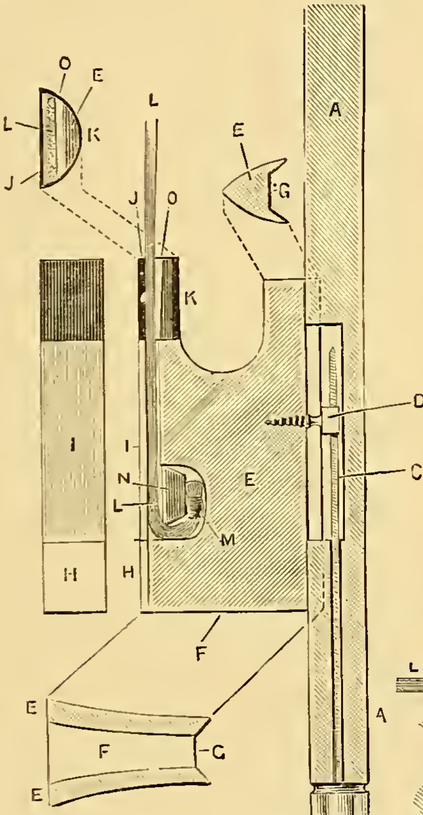


FIG. 124.
NUT AND SCREW, AS FIXED ON STICK OF BOW.

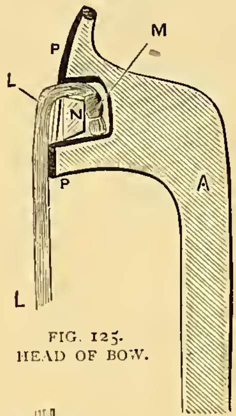


FIG. 125.
HEAD OF BOW.

FIG. 127.
KNOT OF HAIR.

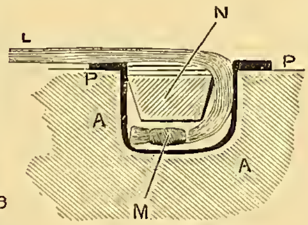


FIG. 126.—BOX IN NUT.

References to Letters in Figs. 124—127. A, Stick of Bow; B, Screw head; C, Screw; D, Eye fixed into nut; E, Nut; F, Heel-plate of nut; G, Sliding-plate, fitting and sliding on A; H, Silver plate; I, Mother-of-pearl forming slide; J, End of ebony strip on which H and I are mounted; K, Silver band slipped over end of E, embracing J, L, O, and E; L, Hair of bow; M, Knot of hair; N, Wedge to hold M in box; O, Wedge to press against K; P, Plate of head of bow.

Red horsehair has been recommended in preference to white, as "biting" better, consequently on the action of the dye; but this is a fallacy, as its only effect is to produce a coarseness of tone. Dr. Nicholls, who invented a huge cumbrous form of fiddle, so heavy in wood and construction that it could be used for corking bottles, much better than for "discoursing dulcet melodye," introduced for the purpose of evoking its three-horse power tone, a huge bow, whose stick was ½ an inch thick at the nut, and bombé in the centre, which was fitted with red hair, and made of some light wood, which makes them wonderfully light in proportion to their size. These fiddles and bows (specimens of which may be seen in M. Georges Chanot's shop in *Wardour Street*) are curiosities in their way, but deadly in other respects. The celebrated bow-makers are not many in number; after Tourte, junr., the first of any importance was Jacques Lafleur, of Paris (1760—1830). He was one of the best makers, his work being often as good as Tourte's, with which they are very frequently confused. After him came Francois Lupot, brother of Nicholas, the great Luthier of that name, who devoted himself solely to the manufacture of bows, in which he undoubtedly excelled.

In England our greatest maker was John Dodd, who has justly been called the English Tourte. He lived and was buried at Kew, living and working alone, for he never took an apprentice, who might learn the secret of his art, for the divulgence of which, it is said, he was once offered, and refused, £1,000. His violoncello bows are the best, but his violin bows, though sometimes a shade too short, are the best England has known of native manufacture, and as such command high prices. Nevertheless, Dodd died in Richmond workhouse. He was followed in the mastery of bow manufacture by Louis Panormo, the son of the violin-maker, Vincent Panormo, whose bows are much esteemed by violinists. The only contemporary bow-maker with any claims to celebrity is James Tubbs, who if so disposed will make the most exquisite and scientific bows, on his own terms. The bows of James Tubbs are even now much sought after, and will, in time to come, be valuable from their scarcity and sterling qualities.

(*To be continued.*)

AN IMPROVED FRET-SAWING MACHINE.

By DICKSON G. LAKER.

(*For Illustrations, see Supplement to this Part.*)

THE limited range of work admitted by the ordinary fret-sawing machines has been a serious obstacle to many. To obviate this, I have designed and constructed a machine (working drawings of which accompany this part) which will meet the requirements of most amateurs, as it admits work up to 30 inches in the clear. An important feature is the substitution of slides for the usual pivoted arms, which ensure a marked improvement in the cutting, while any thickness of wood not exceeding 1½ inches may be easily dealt with. The double connecting-rod will admit of the use of short (broken) saws, which otherwise become useless. The table extends the whole length of the machine, and will be found very useful in supporting heavy work.

In constructing, take as a starting-point the backbone, which should be 4 feet by 4 inches by 2 inch yellow deal. In this cut the horizontal mortise holes in position, shown in Fig. 1, and into these fit the four pieces shown in Fig. 3, in section (and in plan with bearings in position), the ends of these pieces being slotted as shown.

Before fixing the upper pair of arms permanently, cut the vertical mortise hole, into which fit the support Fig. 2 ; to this screw the topmost arm. Between each pair of arms, at a short distance from the ends, fit a distance-piece, Fig. 4, which may be either screwed or nailed. The lower part of the backbone must be cut away as shown in drawing, to fit over lower back cross-piece. The framework may now be made of 2½ inch by 1½ inch deal. The front uprights, Fig. 5, must have mortises for the bearings, cut 12 inches from the ground ; the back uprights, Fig. 6, are similar, with the exception of the mortise holes. The front cross-piece and lower back, Fig. 7, are alike. The cross-piece for bearings must be prepared for them, as shown in Fig. 9, while Fig. 8 represents the upper back cross-piece, with slot to admit backbone to the depth of 1⅞ inches.

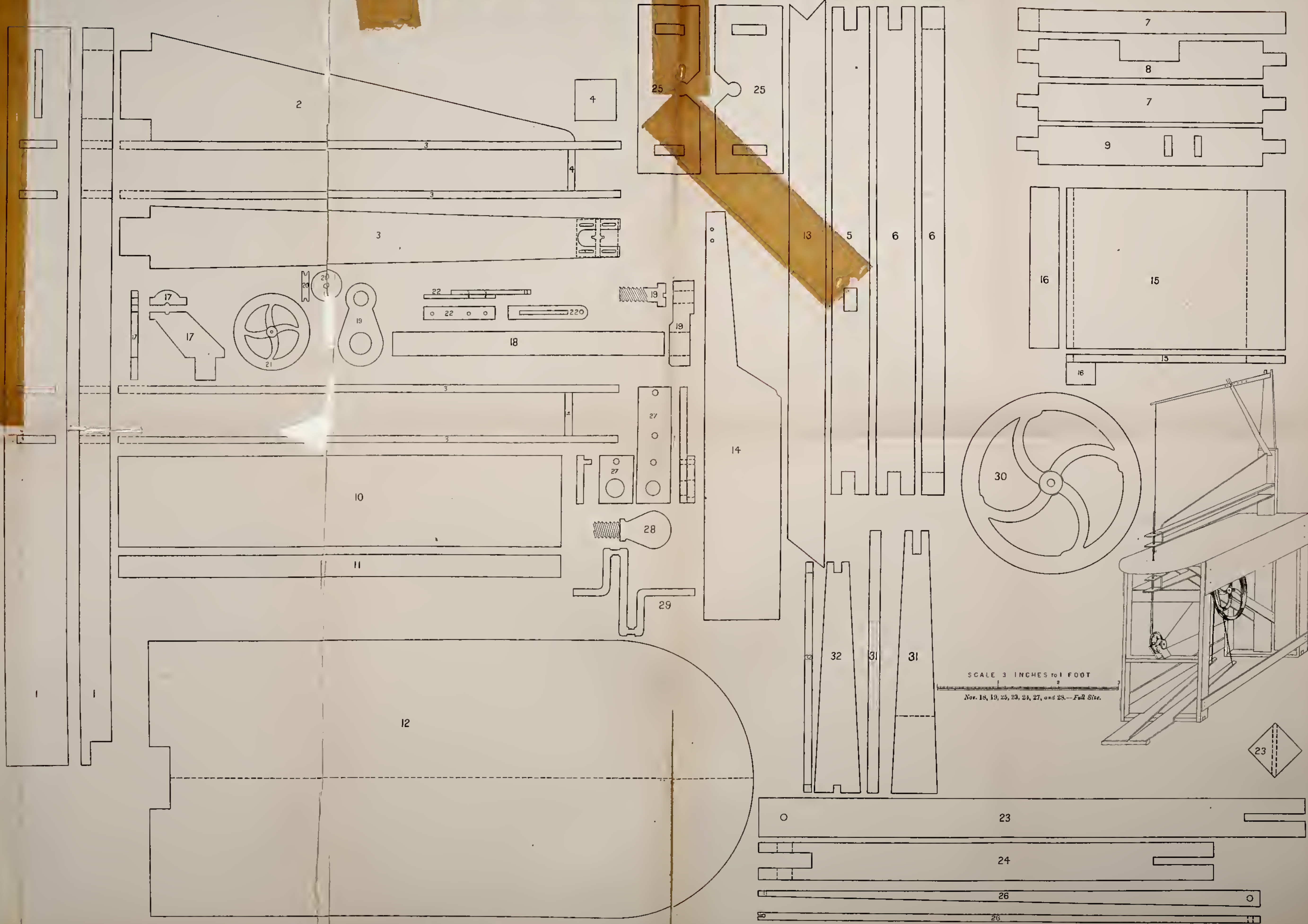
Previous to fixing Fig. 9, the bearings (hard ash), Fig. 17, must be fitted and glued into position, the bearings themselves having been finished. The caps are fixed to the bodies of the bearings with screws, a ⅜ inch hole being bored for insertion of spindle. Having completed the frames, they may be fixed together with the ½ inch boards, Figs. 10 and 11. The broader pieces are nailed to top of sides, and the narrower about 1 inch from the ground.

The table, Fig. 12, is made in two pieces, the joint shown by dotted line, being glued, while on the under side may be fixed two cross-pieces, about 16 inches in length, to add to the rigidity.

Having proceeded so far, fix backbone in position, nail at the bottom to the lower back cross-piece, and fit in the slot in upper cross-piece as before mentioned, two screws passing from the cross-piece into the backbone, hold it securely in position. The slides, Figs. 23 and 24 (full size) are of hardwood, apple, or ash (⅝ inch square); either answers very well. The upper slide, Fig. 23, has a hole bored at one end for the string from bow, while the lower end is slit up to receive clamp. The lower slide, Fig. 24, is slotted at upper end for clamp, and at the lower to receive the connecting-rod, a ¼ inch hole being bored, as shown by dotted lines, to take a wooden pin, which secures the connecting-rod in position. All the slots are made diagonally as shown by dotted lines in end view of slides. The bearings of slides, Fig. 25, are of hard ash, ½ inch thick ; two pairs to each slide ; the top bearings are screwed, one pair above topmost arm, the other pair below lower top arm, and the bottom pair of bearings in corresponding positions. The slots in bearings allow the slides to be fixed in a position parallel to each other, and also compensate for any wear which may take place. By loosening the tightening screws, the bearings may be shifted backwards or forwards until the slides are in a perfectly vertical line, the screws, however, should not be tightened up until slides are adjusted. The lower arms must be supported near the front end by a piece of board, 3 inches deep, nailed to inside of front legs, and to the arms, as shown

PRESENTED WITH PART XIV. OF

AMATEUR WORK, ILLUSTRATED.



FRETSAWING MACHINE FOR AMATEURS, DESIGNED BY DICKSON J. C. LAKER.

WARD, LOCK & CO. WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

in perspective view of machine. This board must not be put in position until the two supports for crank-shaft are fixed; these, Fig. 13, are nailed at one end to under and inner sides of upper front cross-piece, 4 inches apart, and at the lower end to backbone, one on each side, about 8 inches from ground. A ½ inch hole is bored in each, in position given to admit crank-shaft, Fig. 29, made of ½ inch round iron. The two cranks work between the bearings, the ends may be turned, and the crank-pins filed into shape.

A 12 inch driving-wheel, weighing about 20 pounds, and having ½ inch hole in the centre, should be fixed on the right end of the shaft; this wheel is shown in Fig. 30, drawn to scale, but it need not be exactly to drawing, any wheel with a groove, and about the weight and diameter mentioned, answering the purpose. The crank-shaft should be put in place before nailing both its supports in position. The table can now be nailed on to side-boards and framing.

The treadles, Fig. 14, are of ¾ inch stuff, hinged ⅛ inch apart to treadle-board, Fig. 15, and ½ inch from its front end; the treadle-board, made of ½ inch deal, is nailed to top of lower front cross-piece up to dotted line, and piece, Fig. 16, is the same breadth as treadle-board, to which it is nailed, as shown in sectional view. Through the holes shown near front end of treadle, a staple of wire 3/16 inch in diameter must be driven, and the ends turned out underneath. The connection between cranks and treadles is made with similar wire; turn the right crank down to its lowest position, make a hook at one end of the wire, pass this over crank-pin, and through staple in treadle, then lift the treadle until it clears the front part of the treadle-board by about 1 inch, the end of the wire may then be twisted round two or three times a short distance above staple: proceed in the same manner with other treadle.

The spindle, Fig. 18 (full size), is of ⅜ inch round iron. A crank, Fig. 19, is shrunk upon one end, while upon the other, fixed by set-screw or otherwise, is the pulley, Fig. 20. When in position, the crank is upon the left end of spindle; the balance-wheel, Fig. 21, between the bearings, and the pulley upon the extreme right, a round leather band passing from it to the driving-wheel.

The connecting-rod, Fig. 22, of ½ inch ash, is made in two pieces, the upper part having ¼ inch hole a short distance from rounded end, and a slot extending the greater part of its length; the lower half (shown to the left) has ¼ inch hole to fit the plain part of crank-screw, Fig. 19; this screw must fit tightly into crank. Two stout screws, about ¾ inch long, clamp the connecting-rod pieces securely together, a glance at the drawing will make this clear. Fig. 27 gives several views of clamps which are of ⅛ inch steel. The smaller pieces have pins driven into them, and these fit into holes in the larger pieces to prevent the smaller from turning; the two small upper holes in clamps are for fixing into the slides, pieces of wire being driven quite through slides and holes. In Fig. 28 are represented the clamp-screws, full size.

Fig. 31 shows the support of bow, and which is nailed to backbone up to dotted line, the bow, Fig. 26, being fixed into the slot of support, a pin passing through securing it in position. A hole is bored about ½ inch from front end of bow, and then deeply countersunk, the wood between hole and end of bow then removed. The string can thus be taken out and replaced in a moment, and by means of the knots upon it any desired tension given. A forked piece, Fig. 32, is fitted over support of top arms, and screwed to front of backbone; the upper end has a slot in which lies the bow, secured in position by a pin.

The top slide must be lowered until the clamp touches the table, then mark out the shape of clamp, find centre of same, and bore ⅝ inch hole through table to admit of the free passage of saw. A coating of plumbago will greatly facilitate the working, and prevent the wearing of slides.

RELIEVO MAPS AND THEIR CONSTRUCTION.

By JOHN BRION,
Constructor of Relievo Maps to H.R.H. the late Prince Consort.

I.—INTRODUCTORY—MAP OF ENGLAND AND WALES.

IT is generally conceded that the most natural and effective mode of representing objects is by truthful modelling. Paintings and drawings, however ably executed, cannot give, at one view, complete transcripts of the things represented. To nothing does this observation apply with more force than to geographical subjects. I think every one will admit that it is impossible to imagine elevations, and all the varieties of peaks, ridges, water-partings and table-lands, with any degree of accuracy upon a flat surface map. The most elaborate hill shadings only indicate positions and areas; natural forms and altitudes remain unrepresented except in these vague points; light shading indicates moderate elevations, heavy shading higher ones. The late A. Keith Johnston was so strongly impressed with the futility of hill shading that in many of his finest works he abandoned it, substituting plain black lines to mark the positions and directions of elevated tracks, and his plan has been frequently adopted by others. But the method, although it frees a map from much confusion, fails to give

the slightest indications of form or height. So entirely has the superiority of modelling over all other methods of geographical representation been admitted, that many clever attempts have been made to give the effect of relievo work by what are termed photo-relievo, and panoramic maps ; but in all of these there are, of necessity, grave errors in perspective, to say nothing of the futility of endeavouring to present by those methods an "all round view" of hilly or mountainous regions.

It will perhaps be said : If the superiority of relievo maps over flat surface ones be so great, why have they not been admitted to more general use? The answer is easy : On account of their great cost. A good quarto map of Switzerland can be obtained for two shillings, while Keller's admirable relievo of the same costs as many guineas. I can vouch for the fact, that where it has been found practicable to issue a relievo map at a moderate price, the sale has been speedy and extensive. To obviate the serious objection of price, and to enable any one, who is desirous of so doing, to acquire and embody exact ideas of any carefully explored portion of the earth's surface, the present papers are designed. The art will be found easy of acquirement and inexpensive in practice, while its pursuit will not only infix more deeply the knowledge already possessed, but will expand the mind, gratify the constructor with the sense of exercising a species of creative power, and silently correct errors that have been unconsciously cherished for a lifetime. The artistic results will, moreover, abundantly repay a little devotion, a well modelled and judiciously coloured relievo map being a species of picture, whereon even the uneducated eye delights to trace the effects of imitated nature.

The constructors of relievo maps have been but few, and all appear up to the present time to have endeavoured to keep their methods secret. Keller, Dobbs, and Brion are the best known. The process employed by them I shall now proceed to explain.

FIG. 2.—SKETCH MAP OF ENGLAND AND WALES, SHOWING PRINCIPAL PHYSICAL FEATURES.

Relievo work may be divided into two classes: maps and models. As the map is embossed from the model, it is obvious that the construction of the latter is all important. Let us commence the task.

Assume that we have decided on constructing a relievo map of England. Our first step will be to procure two copies of the sheet map of the size that we desire. Keith Johnston, Stanford, Wyld, and Letts, have very good varieties from sixpence upwards. The maps must be uncoloured, unmounted, clear and simple in the engraving. Keller and Dobbs constructed their own maps, and printed them upon paper specially prepared for embossing ; for a considerable time I did the same, believing it to be indispensable, but experience taught me that any ordinary flat surface is capable of being made into a relievo, thus saving the cost of drawing and engraving a special map for the purpose. Imagine the chosen map to be before us.

Our first care must be to procure a piece of well seasoned and smoothly planed board, about one and a half inch wider all round than the map we intend to

model. Make a moderately thick paste thus: Polson's corn flour half a pound, one teaspoonful of powdered alum, mix gradually with cold water to the consistence of cream. Boil in an enamelled or well tinned saucepan for three or four minutes, stirring constantly. The result will be a beautiful white paste, almost as adhesive as the famous one of the Chinese, and far before any other I have tried.

The board and paste being ready, soak one copy of the map, together with a sheet of cartridge or brown paper, of the same size as the map, in clear cold water till they are saturated. Take care that they lie perfectly flat. A tea-tray makes a good bath for this purpose. Paper of a soft texture will readily imbibe the water; that of a harder quality will require a longer time. (*Note*—Paper of a soft, fine texture, not very stout, is best adapted for relievo work.) Remove the map and paper from the bath, and carefully lay them upon a piece of white calico in order that it may absorb all superfluous moisture. Let them remain to expand for about ten minutes. Take your paste brush (a painter's hog-hair tool is well adapted for the work), work the paste well into the back of the board and upon one side of the blank sheet of paper, mount the paper upon the board. (*Note*—Be careful not to leave much paste upon your paper or maps at any time, but work it well into the pores, crossing and recrossing the action of your brush repeatedly in order to guard against missing a single spot, which oftimes spoils an otherwise good piece of work.) Mount the map upon the front of the board, It is a good plan to place a sheet of blank paper over the map, and with a round rule, or other roller, work evenly and repeatedly over the surface. The mounting being satisfactorily done, leave the work to dry, but avoid placing the board in the sun or near to a fire. The reason for using the paper at the back of the mounting board is to compensate the warping that would otherwise arise from the contraction of the map in drying. The motive for mounting the map in a thoroughly expanded

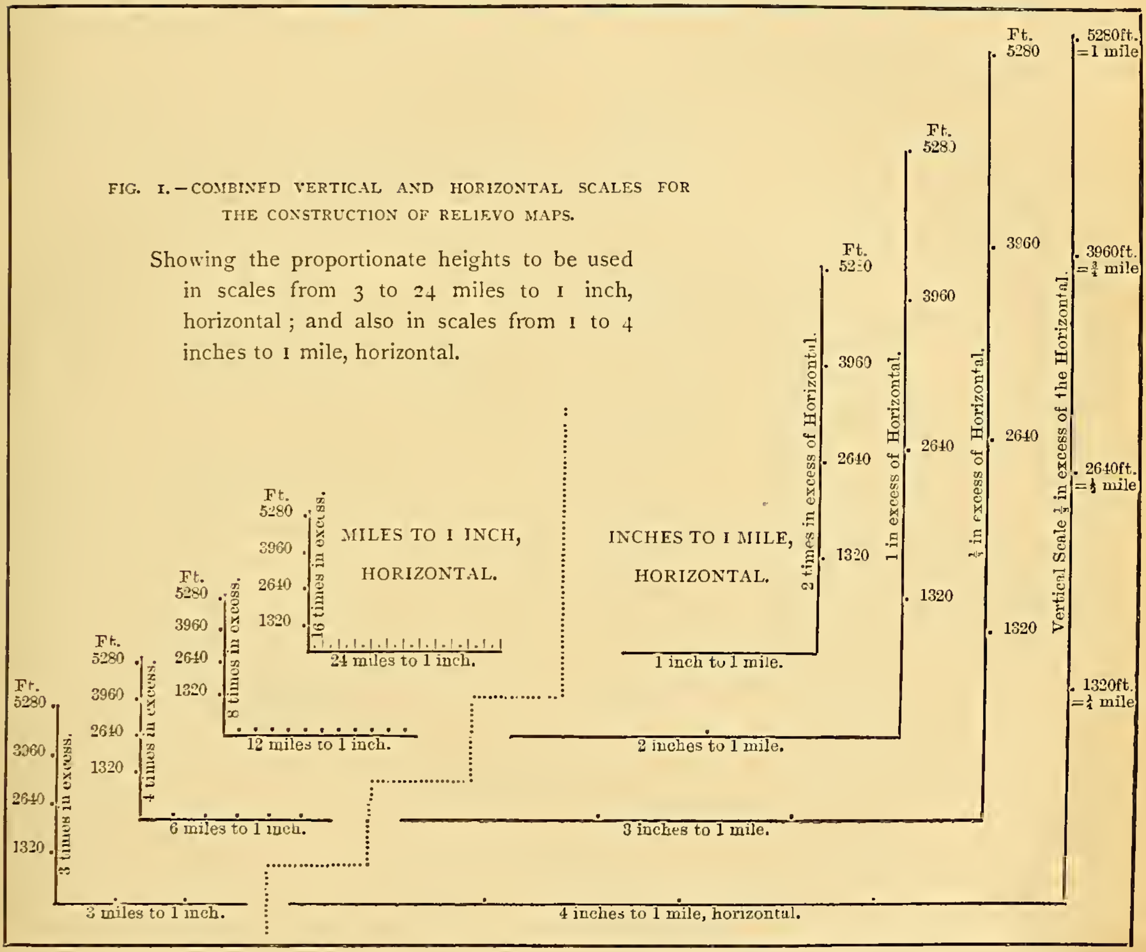


FIG. 1.—COMBINED VERTICAL AND HORIZONTAL SCALES FOR THE CONSTRUCTION OF RELIEVO MAPS.

Showing the proportionate heights to be used in scales from 3 to 24 miles to 1 inch, horizontal; and also in scales from 1 to 4 inches to 1 mile, horizontal.

state is a simple, but all-important, point in the process, for if it were mounted dry, the wet maps would, by expansion, be too large for the die when prepared for embossing, as hereafter described.

The time for thoroughly drying the mounted map depends on the weather and the warmth of the room in which the board is placed. Generally, twenty-four hours are necessary, as it is unadvisable to commence modelling till the map is quite dry. Suppose this to be the case, we can now take our next step, which will be to determine, and permanently mark, the positions and altitudes of the chief hills, mountains, etc.

The question of the relative proportions that should be observed between the vertical and horizontal scales in relievo map work has led to much discussion between mathematicians and geographers, some advocating an exact balance of scales, on the reasoning that it is the only natural mode of representation, others have recommended great exaggerations in the vertical work, on the ground that it produces clearness and boldness. To my mind, the true meaning will be found in that scale which gives to the relievo the appearance which nature presents to the eye. Equality between the vertical and horizontal scales cannot possibly be observed in works of small, or even of moderate, size. The Cumbrian Group so modelled would be scarcely perceptible on a map of 20 miles to an inch; the South Downs would be raised no higher than the thickness of a small-sized pin or needle. Some severe scientists scorn a relievo which presents an exaggerated vertical scale, but surely they do not consider that all vertical objects are exaggerated in our minds when viewed by us. We remember, for example, the height of a hill or a church tower pretty accurately, as seen from a near stand-point, but we rarely take into consideration the proportion they bear to the plane extent of a few square miles of the country around The truth of this assertion may be easily tested by taking from the Ordnance Map of England (scale 1 inch to 1 mile) a portion of any district with which you are acquainted. On this, by an equal vertical scale, model a church tower 200 feet in height, and hills from 500 feet upwards. Present your work to anyone who knows the locality, and it will elicit the remark: "I thought the hills, etc., were higher than that." We repeat that the true, natural scales for relievo work are those which are admitted to represent vertical objects in their *apparent* and *remembered* proportions. To obtain these I have found the following rules as good general guides:

On a map of six inches to one mile, or greater, an equal vertical scale will produce a natural representation, unless the locality is very low, in which case an increase in the vertical measurements of ⅛ to ½ times will be found necessary.

On map	4 ins. to 1 mile	increase vertical scale	⅛	time
,,	3 ,,	,, ,,	⅓	,,
,,	2 ,,	,, ,,	1	,,
,,	1 ,,	,, ,,	2	times
,,	3 miles to 1 inch	,, ,,	3	,,
,,	6 ,,	,, ,,	4	,,
,,	12 ,,	,, ,,	8	,,
,,	24 ,,	,, ,,	16	,,

A mathematician will have no difficulty in forming the scales for working purposes, but to such of our readers as are not mathematical the following directions will be acceptable:—

Take the horizontal scale of any map which you intend to emboss; for example, a map of England and Wales of 24 miles to an inch. This, by the foregoing table, should have a vertical scale 16 times greater than the horizontal. Measure off an inch upon paper, divide it into 24 parts, each of which will represent one mile, or 5280 feet. Set off sixteen of these parts upon a line, and from it cut (rejecting fractions) $\frac{1}{20}$th part. Divide the remainder of the line into five equal portions, and each will represent 1000 feet vertical, sixteen times in excess of the horizontal. The set of scales given in Fig. 1, may, however, save the constructor some trouble.

I have been thus minute in discussing the question of scales because it is an all-important factor in the successful pursuit in the art I am treating of. Haphazard work is certain to result in absurdity or disappointment; but I wish to impress upon the reader the necessity for comparing, whenever practicable, the model while in progress with the objects sought to be represented, and slight variations of our tables will then oftimes lead to satisfactory results. Let us now return to the mounted map left to dry.

Having marked your vertical scale upon a piece of cardboard, boxwood, or ivory, and being provided with shoemaker's rivets or fine brads 1½ inches to ½ inch in length, place one on the spot marked 1 upon the map given in Fig. 2. This represents the highest part of the Cheviot Hills. Drive the rivet or brad perpendicularly into the board till it measures 2658 feet by your graduated vertical scale. Proceed to Cumberland and Westmoreland, and in like manner drive rivets to denote the summits of:

2. Sca Fell, 3229	5. Saddleback, 2787
3. Helvellyn, 3055	6. Grassmere Fell, 2756
4. Skiddaw, 3022	7. High Pike, 2101

Cross eastward to the York Moors and mark Bolton Head, Danby Beacon, hills above Robin Hood's Bay; then return to the Cheviots, and work down the Pennine Range by Aldstone Moor, Killhope Law, Cross Fell, Shunor Fell, Great Whernside, Pennigant, Holme Moss, Kinderscout, Axe-edge Hill, to the Peak in Derbyshire. The heights of these will be found in

the subjoined table. Wales will now claim attention. Point off the heights of Snowdon, Cader Idris, Plynlimmon, the Black Mountains, and thus, step by step, deal with the Clent, Clee, Malvern, and Cotswold Hills; the Lincoln Heights, Central Table-land, East Anglian Heights, Chiltern Hills, Mendip, Polden, and Quantock Hills; Exmoor, Dartmoor, and the Cornish Heights; Snea Fell, Isle of Man, Holyhead, St. Catherine's Head, Isle of Wight.

All well-constructed maps of England give the names which we have enumerated, together with shadings indicating positions and areas, but all maps have not the heights figured (an omission which frequently perplexes the student, and merits the attention of cartographers and publishers generally), I therefore note the chief of the elevations of our land, together with their localities and geological characters.

Names of Hills, etc.	Heights in feet	Localities.	Geological Formations.
ENGLAND.			
Cheviot Hill	2669	Roxburgh	Porphyry
Wisp Hill	1040	W. of Cheviot	,,
Sunniside	1407	S. spur of Cheviot	Carboniferous or Mountain Limestone and Millstone Grit.
Rufflaw	495	Near Morpeth	
Aldstone Moor	1000	Pennine Range	
Kilthope Law	2196	,,	,,
Cross Fell	2927	,,	,,
Water Crag	2186	E. Kirkby Stephen	,,
Shunor Fell	2399	Pennine Range	,,
Great Whernside	2310	,,	,,
Pennigant	2273	,,	,,
Little Whernside	2384	,,	,,
Pendle Hill	1803	,,	,,
Rivington Hills	1515	,,	,,
Holme Moss	1857	,,	,,
Kinderscout	1981	,,	,,
Axe-edge Hill	1751	,,	,,
Peak	1981	Derbyshire	,,
Mole Cop Hills	1100	S. Congleton	,,
Weaver Hills	1154	W. Ashbourne	,,
Bradford	324	Yorkshire	,,
Sheffield	167	,,	,,
Sca Fell	3229	Cumbrian Group	Porphyry Slate and Mountain Limestone.
Helvellyn	3055	,,	
Skiddaw	3022	,,	
Saddleback	2787	,,	,,
Grassmere	27[illegible]6	,,	,,
High Peak	2101	,,	,,
Bolton Head	1489	York Moors	Lias and Oolite.
Loosehoe	1404	,,	
Wilton Beacon	809	York Wolds	,,
Robin Hood's Bay Cliffs	605	York Coast	,,
Filey Bay Cliffs	436	,,	,,
Flamboro' Head	159	,,	,,
Lincoln Heights, average of undulations	600	Lincolnshire	,,
Lincoln	356	,,	,,
Grantham	213	,,	,,
Wrekin	1320	Shropshire	New Red Sandstone,
Clee Hills	1805	,,	
Clent Hills	1007	Staffordshire	,,
Malvern Hills	1444	Worcestershire.	,,
Cleeve Hill	1134	Cotswold Hills	Oolite
Broadbury Beacon	1086	Gloucestershire.	,,
Daventry	366	Central Table-land of England.	New Red Sandstone Lias and Oolite.
Rugby	316		
Market Harboro	348	,,	
Lutterworth	426	,,	
Marlboro' Downs	905	Bucks	Chalk.
Hungerford	318	In the Vale of Kennet	,,
Newbury	264	,,	,,
Reading	135	,,	,,
Chiltern Hills	830	High Wycombe, Bucks	,,
,, ,,	904	Dunstable, Beds.	,,
The East Anglian Heights, Gog-magog Hills	302	Cambs	,,
Newmarket	369	,,	,,
Mendip Hills	999	Somerset	Old Red Sandstone & Limestone.
Polden Hills	837	,,	
Quantock	785	,,	
Inkpen Beacon	1011	North Downs	Chalk.
Leith Hill	993	,,	,,
Hind Head	928	,,	,,
Hollingbourn Hill	616	,,	,,
Folkestone Cliffs	575	,,	,,
Dover Heights	409	,,	,,
Fairlight Hill	599	Hastings	Wealden Sands of Clays.
Beachy Head	564	South Downs	Chalk.
Ditchling Hill	856	,,	,,
Chanctonbury Hill	814	,,	,,
Butser Hill	917	,,	,,
Salisbury Plain	775	Wilts.	,,
Purbeck Heights	817	Dorset	,,
Dunkerry Beacon	1668	Devon Exmoor	Carbon. Limestone & Sandstone
Rippon Tor	1549	Dartmoor	Slaty Limestone and Granite.
Cawsand Beacon	1792	,,	
Brown Willy	1368	Cornish Heights	,,
Karnbonellis Hills	829	,,	,,
ISLANDS.			
Snea Fell	2024	Isle of Man	Clay Slate.
St. Catherine's Hd.	830	Isle of Wight	Chalk.
Freshwater Cliffs	715	,,	,,
Dunnose Point	792	,,	,,
Holy Head	709	Holy Isle	Primary Limestone.
N. Beaumaris	523	Anglesey	,,
Llanelidan	582	,,	,,
WALES AND THE BORDERS.			
Snowdon	3590	Carnarvon	Various. Lime and Grit-stones (Lower Silurian) with Trap Rocks
N. E. Peak	3471	,,	
Cader Idris	2914	Merioneth	
Arran Mowdry	2955	Montgomery	
Plynlimmon	2463	,,	
Tregaron Mount	1747	Cardigan	,,
Precelly Mounts	1754	Caermarthen	,,
Wrexham Hills	1857	Denbigh	,,
Long Mynd	1674	Salop	Shales and Limestone.
Kerry Hill	1895	Montgomery	Upper Silurian.
Llandinam	18[illegible]8	Radnor	,,
Black Mountains	2864	Brecknock	Old Red Sandstone and Carboniferous Limestone.

(*To be continued.*)

HOUSE-PAINTING AND PAPERING.

By GEORGE EDWINSON.

I.—INTRODUCTION.

IN this and the following papers on House-painting and Papering, the writer does not presume to teach those about to enter the profession, nor to improve those already engaged as professional painters. He writes as an amateur painter for his brethren in out-of-the-way places, his sole aim being to aid them with hints and instructions in the art, sufficiently clear and comprehensive to enable them to lay on a bit of colour in their own homes. To ensure the best practical advice in carrying out this work, he has engaged the services of a practical painter, who will furnish those little wrinkles which go to fill up the measure of success in finishing a job.

With the increase of small house owners, due to the facilities for acquiring house property afforded by building societies to thrifty workmen, there has arisen a demand for a less costly means of keeping houses in repair than that of engaging the services of professional painters, paper-hangers, and decorators to do every little necessary repair. Many such house-owners would gladly employ their leisure hours in improving the appearance of their little properties if they knew how to set about it, the tools and materials they should employ, and how to use them. In some few cases they are fortunate enough to be situated, like the writer, within reach of a friendly fellow-workman able and willing to render assistance with advice and the loan of a few tools, but in many others they are far removed from all such means of assistance.

Should the reader be able to purchase his materials from an oil and colour store, the obliging shopman will generally tell him how to mix and lay his colours, and also give him some useful practical hints ; but, after all, those assuredly will not be equal to those given in such a book as AMATEUR WORK, since they will entail a certain amount of dependence, confession of ignorance, and a liability to be forgotten ; whilst these will render a man, to a certain extent, independent, and be always at hand for reference. There is also another class of readers situated in out-of-the-way places, at a distance from oil-shops and friendly assistance, who would be glad to know the names of materials, how to prepare them at home, and how to apply them when thus prepared. It will afford us much pleasure to render them some assistance by telling them how to buy, what to buy, and how to make use of the material.

For the sake of convenience we have assumed the existence of an eight or ten-roomed house, needing renovation and repair throughout. This will give us the opportunity of explaining the style of work suited to each part of the house, and to each suite of rooms, whilst it will cover all possible requirements in a smaller house. When to this is added the repair of out-premises, we shall probably meet the wants of all.

We will commence at the top of the house if you please, and deal first with the servant's bed-rooms, because, by so doing, we shall be able to clear off any dirt or mess we may make on the stairs, and leave all clean and bright behind us.

The first jobs before us are those of washing the ceilings, stripping, cleaning, and stopping the walls, and cleaning the paintwork, together with repairing defects to doors or windows. We must therefore see to it at first that all furniture is removed out of the room, or fully protected from splashes of whitewash, water, or paint, for, let a man be ever so careful, some stray splashes will somehow find their way on to any piece of furniture left in the room. We strongly advise the entire removal of furniture where at all possible, but where it is not possible to do this the carpet must be taken up, this and the furniture grouped together in the centre of the room, and covered with some washable material such as brown holland or old sheeting, this will leave the workman free to move around by the walls, and will prevent soiling by moving the furniture while the work is in progress. It will also be advisable to move electric bells, and bell pushes, or any other ornamental wood or metal-work, for amateurs will more readily soil these than restore them to their proper condition. To do this, disconnect the wires at the terminal screws of the bell, and take the bell down, also detach the wires from the push fittings, and take them off. Also remember to remove blinds, blind cords and pulleys, and any other things likely to be soiled.

All being now made clear, we will turn our attention to the necessary tools. We shall require at first *a distempering or whitewash brush* (Figs. 1 or 2), cost from 7s. 6d. for one made of good hair, down to 5s.6d. for mixed grass and hair, or as low as 3s. 6d. for common grass. This latter class of brush is not at all suitable for ceiling work, being only fit to be used on rough bricks in out-buildings or cellars, and can only be depended upon for once. The best and higher priced brushes will be found most economical in the end, because they will last longer and put on less material with a much superior finish. Grass brushes, and even the mixed brushes, leave unsightly streaks on the ceiling and splutter the distemper about. An old brush will serve our purpose for washing the ceiling and wetting the walls, but we must impress the amateur with the idea that even the washing must be well and thoroughly done to ensure after success, for, dirty

streaks, and especially those left from smoked patches will spoil the subsequent coat of whitewash.

We shall next require *a stopping-knife*, (Fig. 3), cost from 8d. to 10d. It will be seen that this knife is short and spear shaped, it should also be stiff enough to form a miniature trowel and will thus differ from the palette knife, which should be broad, thin and flexible. The use of the stopping-knife is to stop or repair cracks and holes in the plaster or ceiling with a mixture of plaster and whiting, or to stop crevices or holes in wood-work with putty or with a paste made of putty and white lead. When we have to encounter blisters or ugly excrescences on old badly painted work, it will be necessary to have a thin chisel-pointed knife, which will act as a plane in levelling off all protuberances. The paint will then have to be scoured and rubbed down with pumice stone in water, so a lump or two of this material, costing about 6d., must be included in our list of tools. A pail, plenty of clean warm water, a pair of trestles and a plank, or a step ladder and a kitchen table, or something similar to form a portable platform, will complete all the plant at present. It is strongly advisable to have such a long platform, as that furnished by a plank on two trestles when washing the ceiling, for it enables the workman to move rapidly and carefully along when he is confident of room to move and a firm footing. A pair of trestles can be easily and cheaply made at home. The following directions for making a pair appeared in an early number of *Design and Work*. "Get four pieces of wood, 1 inch by 2 inches, 4 feet 6 inches long, four smaller pieces $1\frac{1}{4}$ inches by $\frac{3}{4}$ inch and 1 foot 6 inches long, get an iron pin 1 foot 7 inches long, $\frac{3}{8}$ inch thick, a screw at one end a head at the other, and a nut to fit the screw. Make two frames with your wood, after the manner of a camp-stool, the pin serving for a joint in the centre. A piece of webbing nailed across the top from one extremity to the other will keep your trestles from flying open whilst in use." We should recommend a modification of this design, as shown in the annexed sketch, Fig. 6, where the pin goes through the top part of the trestles, and the lower part of the legs are held together with strong webbing, a transverse piece of wood also gives more stability to the trestle. Such trestles are very portable, and a pair of them the amateur will find useful to form a support for the paste-board when he commences paper-hanging.

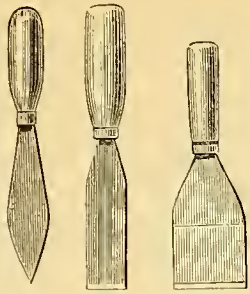


Fig. 3. Fig. 4. Fig. 5.

FIG. 3. — STOPPING-KNIFE. FIG. 4.—CHISEL-ENDED KNIFE FOR CLEANING OLD PAINT-WORK. FIG. 5.—SCRAPER.

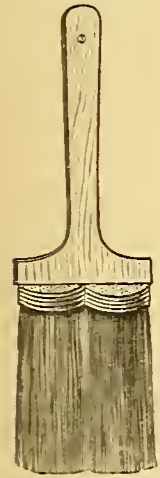


FIG. 1.—WHITE-WASHING OR DISTEMPERING BRUSH.

Costume.—Before we commence further operations, we shall do well to provide ourselves with a working costume of some washable material. The coat must be taken off, shirt-sleeves turned up above the elbows, and it will be advisable to put on a very old pair of trousers. An old cotton shirt will make a good blouse, and an old night-cap pulled well down over the nape of the neck will make an excellent substitute for a workman's cap. Thus equipped, we may defy the white-wash, which would otherwise simply ruin our clothes and spoil our jet-black locks of hair.

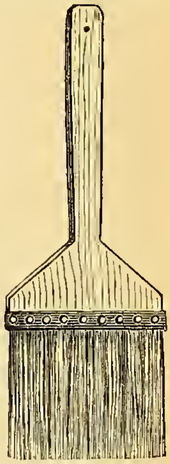


FIG. 2.—WHITE-WASHING OR DISTEMPERING BRUSH.

Washing the Ceiling.—Arrange the platform by the right hand side of the room nearest the window, and work away from the light, or in such a manner as to allow the light from the window to fall on the work, you will then be able to see the progress of the brush. Have a pail of warm water on the platform, wet the brush, and draw it several times backwards and forwards in a narrow line near the wall until the old whitewash appears well soaked with water. Then rinse the brush, press the hairs lightly against the rim of the pail, and thus squeeze out superfluous water, then wipe off all

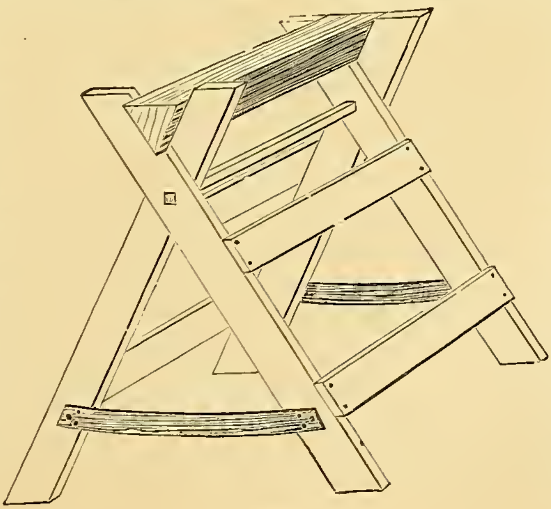


FIG. 6.—TRESTLE.

the dirt and old whitewash from the wetted streak with the damp brush, rinse again, and thus proceed until the streak appears clean. Now wet another streak, and see that the fresh wetting overlaps the old, this will ensure uniform work free from streaks. Clean all the ceiling by a series of such long narrow streaks or sections, working quickly to prevent the edges of one section drying before another has been commenced, and cleaning the whole space within reach of the platform before it is again moved. The brush is held upright in the right hand, and by a dexterous move of the wrist is inclined to the left and right alternately, thus causing the hairs of the brush to be swept obliquely along the ceiling, whilst a slight pressure is given to it by the wrist. Do not work with dirty water, nor take up too much water on the brush at once ; this precaution will need special attention when the wall-paper is clean, and is not to be renewed, in such cases we must be very careful not to splash the walls, indeed, splashing should be avoided at all times ; work clean, and you will work well. If a mate can be got to help you, and the two can work together in unison from both ends of the platform, the result will be more satisfactory than work done single-handed. If there are any cracks or flaws in the ceiling they must be repaired, "stopped" whilst the work is wet as we proceed. To do this mix a small quantity of powdered whiting and plaster of Paris—two parts of the former to one of the latter—on a slate, a tile, or a piece of wood, wet the mixture with water to the consistency of a thick paste, clear out the loose plaster from the crack or flaw with the point of the stopping-knife, and press the above mixture into the crack until it has been filled. This must be quickly done before the plaster has time to set, then scrape off superfluous plaster around the crack, and work the surface of the newly-plastered spot smooth with the broad blade of the stopping-knife. Do not mix more stopping than will be needed at one time, nor attempt to use the remains of any old stopping left on the board. Never resort to the reprehensible practice of pasting the cracks over with paper instead of filling them with plaster.

Cleaning the Walls.—After the ceiling has been cleaned and stopped, we will next turn our attention to cleaning the walls, before hanging a fresh coat of paper on them. Some persons resort to the dirty practice of putting a clean coat of paper on the walls to hide the dirty coat beneath. This should never be done in bed-rooms, for, by so doing, many fatal diseases may be generated in these rooms, which, of all others in the house, should be kept in the best sanitary condition. If we think for a moment of the possible accumulation of poisonous condensed exhalations on the wall-paper, the dead flies and possibly other dead insects stowed away in the cracks, and such other elements of putrefaction as damp paper and old paste enclosed behind a coat of new paper, we shall be only too glad of this opportunity to get rid of the poisonous filth. Commence by thoroughly wetting the paper on one side of the room with warm water applied with the same brushes used in washing the ceiling. When the paper has been thoroughly wetted, peel it off with the tool sketched at Fig. 5. Stubborn spots should be wetted again, and care must be taken not to injure the plaster. All loose paper must now be washed off with the wet brush, and should any flaws, or cracks, or nail-holes be detected in the plaster they should be stopped with the same mixture as that directed for use in stopping flaws in the ceiling. All nails must be removed, and the holes stopped before the paper is hung. Serve the other sides of the room in a similar manner, and clear up all the dirty paper (bury in a hole dug in the garden, if possible, rather than put it in the dust-bin) and proceed to clean the paint-work. I must leave directions for doing this to be given in another article.

(*To be continued.*)

JOINTING WOOD IN ALL ITS BRANCHES.

By JOSEPH COWAN.

II.—HOW TO MANAGE DOWEL-JOINTING.

ALL the instructions given in "hollow or cramp-jointing" (see Vol. I., page 365) should be well impressed on the memory, and then there is little to learn in making the "dowel-joint." A dowel is a peg of tough wood (well represented in a shoe-peg), but made in lengths of 12 or 14 inches, and rounded by driving through a round hole in a steel plate ; care being taken that the dowel fits the hole bored by the dowel-bit—which is the American twist-bit.

Dowels, the amateur wood-worker must remember, should be made before wanted, and kept in a warm place ; then they are ready for immediate use. If this be attended to, and the wood is dry, a joint can be made in a few minutes.

In making a dowel-joint the dowels ought to be from 3 inches to a foot apart, according to the length of your work. When the work is shot straight, mark for your dowels by placing one piece on the other flat down face to face, then square across the two joint edges, at nearly equal distances, and at 1 to 2 inches from each end; then gauge from the face side, in the middle of the stuff, or perhaps nearer to the back than the front, as more wood is always taken off the front in finishing (and it sometimes happens that dowels will show through the surface after a lapse of years,

and has a very condemning look). Indent with a marker where the lines cross; this prevents the bit from *running*, at the start. Put a wood gauge on the bit, so that all the holes may be of one uniform depth (this is essential). Counter-sink the holes; then cut your dowels in lengths—an eighth of an inch shorter than the depth of both holes; round over the ends of the dowels to prevent tripping.

The next step to be taken in dowel-jointing is the preparation for gluing. Place your dowels, when ready, one hour in a warm place; this will shrink them, and enable them to go easily and readily together, for there should be no bungling at the gluing operation. When the dowels are shrunk, warm your joint at the fire: glue the joint, dowel-holes, and dowels. Do not slobber too much glue on, and bear in mind that the glue ought to be moderately thin. It takes longer to glue a dowel-joint than a plain one, and the glue thickens by lapse of time.

There are numbers of professional workmen who know nothing of this mode of jointing; no doubt they will profit by it.

We will now carry the dowel-jointing into what chairmakers call "framing;" that is, shoulder to shoulder, by means of dowels—any dimension—thin or thick, narrow or wide, long or short—such as is found in any framed work. Although dowel-jointing is all but universal in chair-work, it is by no means confined to it, but is largely used in joiners' and cabinet-makers' work: coopers use dry-dowels, and shipwrights iron ones; but with these two latter I have nothing to do, my business is with glued framing. In the preceding remarks on dowel-jointing, full instruction is given as to the making, setting out, and boring; little now remains to be told about bevel-joints. All bevel-joints must be bored square; with the face or shoulder, otherwise they will not go up. To mark the shoulder for boring: Take a card, place it between the shoulders exactly as you would have the work when finished (always having two-face sides to work from), remove one of the pieces; now mark on one shoulder, 2, 3, 4, or more, according to the size of your work, through the card and into the wood; now reverse the card and mark its fellow, still taking for your guide the *two-face sides*. Now warm and glue well both face, holes, and dowels, and let the cramp bear direct on the shoulder, otherwise it will not hug up cleverly.

In my next paper I shall describe the method of jointing thin stuff. I do not make my articles longer than I can help, lest by giving too much at once, and bringing more than one operation before the reader at one time, my remarks may tend rather to confuse than to instruct him.

(*To be continued.*)

FERNERIES:

HOW TO MAKE THEM AND MANAGE THEM.

By DONALD BEDE.

I.—RUSTIC FERN-CASE AND HANGING BASKET.

THE love of ferns is so widespread, the cultivation of ferns is so easy, and the construction of ferneries is so simple, that I am induced to contribute a series of papers upon the above subject, in the hope that many amateurs will derive as much pleasure and profit in making fern-cases and ferneries as I have done. In giving these directions I shall assume that my readers know nothing whatever upon the subject, have very little money to lay out, and possess few and simple tools to work with at first, leaving more elaborate designs, entailing a larger outlay and some experience in the use of the tools used in their construction until later on. The very mention of ferns is suggestive at once of some rustic scene, where nature's principal adornment is simply luxuriant growth; thus in deciding upon the outlines and decoration of a fernery, we shall do well to select such as admit of the ferns themselves forming the centre of attraction; the case itself, while forming a shelter to the delicate plants, being of the simplest form, and decorated with the most "quiet" colours such as will harmonise with the green foliage of the ferns.

Let us now try our hand on a rustic fern case, Fig. 1, measuring, when completed, 22 inches long, 12 inches wide, and 21 inches high, glass on all sides, with a sliding glass door at each end; the whole resting on four white "ottoman feet." This will be found easy to make, and will cost something under three shillings. We shall want a half peck of Roman cement and a half peck of Portland cement, two squares of glass (21 oz.) 20 inches by 12½ inches, two squares 13 inches by 11 inches, and two triangular pieces, 11 inches each way (Fig. 6), two pieces (Fig. 5) 19½ inches long, 11 inches at sides by 10 inches at top, a piece of flat zinc, No. 10 gauge, 21 inches by 13½ inches, four white feet (ottoman knobs, as they are called at the ironmonger's), and a few strips of sheet zinc about a foot long by an inch wide, and some galvanized wire and brass chain to suspend the basket in Fig. 1. Perhaps we had better make this basket first, as it will get our hand in for the more important work of the case.

Have a piece of flat board to work upon and take a 4 inch ordinary flower-pot, which cover with a piece of newspaper, set it upside down on the board; mix in a pot some cement, half Roman and half Portland, to the consistency of a thick batter, and with an old knife commencing from the bottom (Fig. 2), lay the cement all over the paper. As soon as one stratum has

been laid twist three pieces of wire into three eyes, which at equidistant points cement in at the bottom, projecting sufficiently for them to be used to insert the suspension chain ; if the cement is not too thick two coats will make a good strong basket. Make it look as knotty as possible, and leave it to set (Fig. 3), then reverse it. The pot can now be withdrawn, leaving a porous basket with three eyeholes, stick a little cement on the part which was on the flat board, and it is complete (Fig. 4). The amateur may make another or two with advantage, and then proceed to build up Fig. 1. For this purpose score the sheet of zinc $\frac{1}{2}$ inch on all sides, "nick" it at each corner, and turn up the $\frac{1}{2}$ inch so as

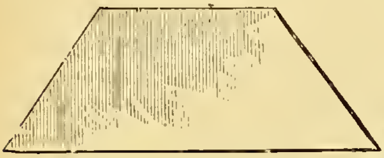


FIG. 5.—SHAPE OF GLASS FOR FRONT AND BACK OF TOP OF FERNERY.

FIG. 7.—BENT WIRE FOR HOLDING SIDES.

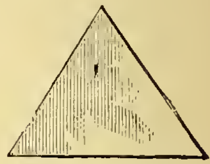


FIG. 6.—SHAPE OF GLASS FOR ENDS OF TOP OF FERNERY.

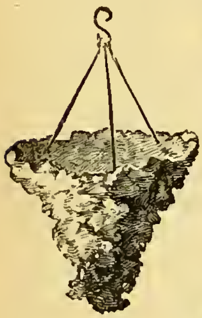


FIG. 4. — HANGING BASKET FOR INTERIOR OF FERNERY, COMPLETE.

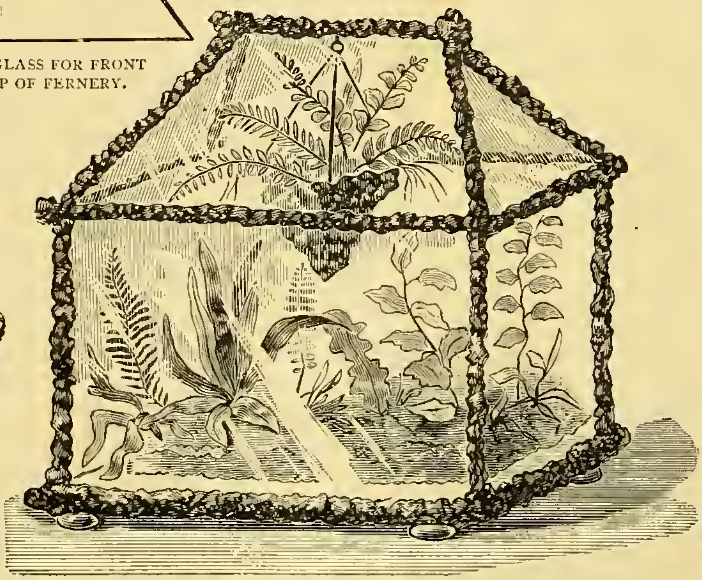


FIG. 1.—DESIGN FOR RUSTIC FERNERY.

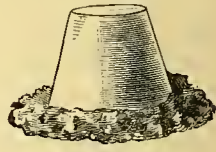


FIG. 2.—FORMATION OF BASKET IN MOULD.

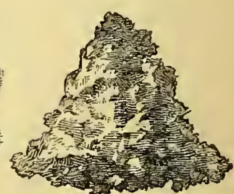


FIG 3.—MOULD WHEN COVERED.

to form a tray. Now take four strips of zinc 12 inches by 1 inch, and bend these together lengthwise so as to form a U-shaped groove. Cover the two squares of glass, 13 inches by 11 inches, with paper, and place one of the U grooves on each of the long sides. These, when finished, will form the slides of the ends. Now take the two large squares and up end the lot in the zinc tray, get some one to hold one side while with two pieces of string you tie the four squares into an upright and square position ; remember that glass of the two ends is to be covered with paper. Now proceed to cement in from the outside, first, the bottom, the tray and the corners, as was done in the making of the baskets, going over all two or three times with cement, not too thick; cement in the corners inside last, and make the bottom edge much thicker than the sides, bend two pieces of stout wire, Fig. 7, to overlap the sides, one at each end on top, cement these in, and when set withdraw the ends (tear the paper and the glass can be easily pulled out), and turn the case upside down and cement an edge on what was the top. The feet can now be screwed on, boring a hole in the zinc with a gimlet. When this is done, set the case upright and stand on the top the sloped glasses in their positions. Place a piece of wire bent to an **S** through the middle of top to hang the basket on. Cement all the edges as before neatly, and when set firm, fill in the corners inside, placing the case on end to do so. The case is now complete, except that a rockwork tray should be made up inside about 3 inches deep and about 2 inches away from the glass on all sides, and a few holes bored in the bottom for air. Plant the ferns in a mixture of peat mould and a little silver sand, upon some broken pots or loose cinders. The raw appearance of the cement may be taken off by dabbing on some oil colours of a suitable tint, chocolate, light green, and a yellow tint here and there, but let the prevailing tone be a rich brown. A little fine shingle placed in the space between the fern tray and the glass gives a pretty effect.

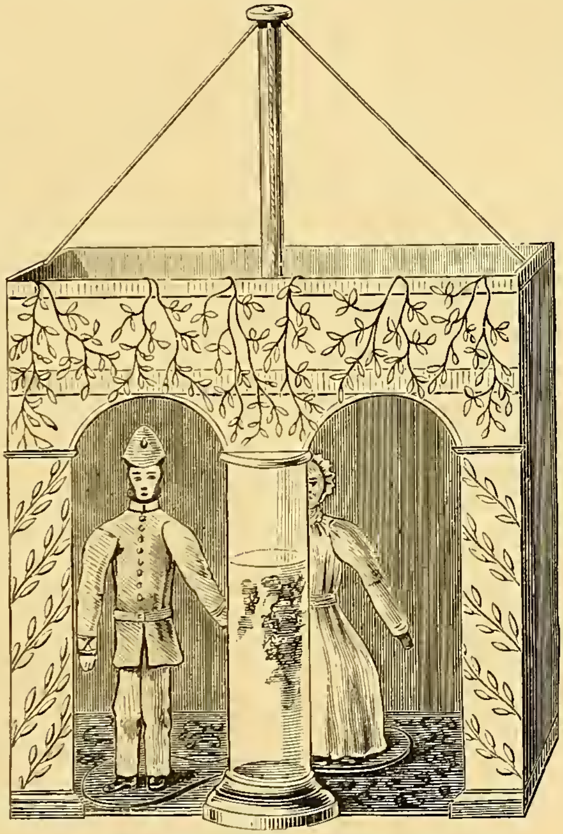
I have found ferns thrive exceedingly well in these cases, and their appearance improves with age.

(*To be continued.*)

A STORM-GLASS, OR HYGROMETER.

By PROSSER PHAYRE.

WHO has not seen the simple little sentry-box hygrometer standing on the mantel-piece of a country cottage? In form it may resemble two sentry-boxes placed side by side—one tenanted by a m niature doll dressed up to resemble a little old woman, whilst the other is made to resemble a little old man. In front, and between the doors of the boxes, rises a flagstaff, to the rope of which is suspended a platform supporting the ancient couple. When this rope and its platform is properly arranged, the funny little pair stand sentry by turns according to the state of the weather—John taking his stand outside on the approach of foul weather, and retiring to make room for Joan when the clouds clear away and the sun shines again. This has always been supposed to be the proper arrangement, but sometimes ungallant John will leave his little old spouse out in the wet and take his stand outside when the weather is fine. The advocacy of woman's rights can scarcely have produced this alteration in John's character, but it is notorious that change of situation and position has an equal demoralizing effect on men and their puppets: the cause of John's defection and its remedy I will notice presently. In other forms of this interesting apparatus, the tiny pair occupy alternately the porch of a church, the portico of a mansion, or the gateway of a fortress or castle.



DESIGN FOR SENTRY-BOX HYGROMETER

This little apparatus is one of the most simple forms of the hygrometer, or measurer of moisture, so named from the two Greek words *hugros* "moist," and *metros* "a measure." The action of all hygrometers depends upon their capability of absorbing moisture from the air when wet weather is approaching, and of giving up this moisture when the air again becomes dry. Several substances are known to do this, and nearly all twisted fibres exhibit this peculiarity, amongst the most prominent being the strings used in violins and fiddles and known as catgut. The little rope, then, depending from the flagstaff and supporting the platform on which John and Joan stands, is nothing more nor less than a short length of fiddle-string, which twists or untwists as it absorbs or gives out moisture. Another, and perhaps more simple form of hygrometer, may be found in a piece of sea-weed, salt, as it comes from the sea, hung up behind the hall or front door; this gets clammy on the approach of wet, or gets dry and rustles in dry weather. This peculiarity is due to the salt left on the weed, which absorbs moisture from the air. A salted string depending from a nail in the wall with a small weight hanging from it, will also serve as a hygrometer. If we mark the wall with a scale drawn with a piece of lead pencil, we shall see that the weight rises in wet weather and hangs lowest in the scale when the weather is dry.

Some very pretty effects can be produced by cutting some leaves and flowers out of tinted paper and then carefully painting them with a solution of chloride of cobalt in water. When the weather is dry, those leaves that were cut out of pink paper will turn purple, and those cut out of blue paper will turn green; but on the approach of damp those tints will fade away, whilst leaves painted on white paper with a stronger solution will pass from green to pink.

Interesting effects are also caused by changes of weather in a solution with which the so-called storm-glasses are filled. The composition of one solution used by some persons is as follows: Dissolve 2 drams of crushed camphor in 4 ounces of rectified spirits of wine, mix 1 dram of sal ammoniac and 1 dram of salt-petre in as much water as will dissolve them, and add this to the camphorated spirit, now add distilled

water to the mixture until a white feathery precipitate is seen to fall, the solution is then ready. Another recipe is a follows: Dissolve $2\frac{1}{2}$ drams of finely-powdered camphor in 11 drams of spirits of wine, dissolve also 38 grains of sal ammoniac, and 38 grains of saltpetre in 9 drams of distilled water, and add this mixture to the camphorated spirit. The mixture must be enclosed in a long phial or long narrow glass tube with its upper end covered with a brass cap, or stopped with a cork, or covered with a disc of bladder with a pin hole punctured through the middle, or either of the mixtures may be put in a test tube, as I will show presently. It has been said that a glass thus prepared will give warning of the near approach of a storm. In dry settled weather the white feathery precipitate will remain quiet at the bottom of the glass, but on the approach of damp weather it will rise and move about in the glass. It has even been said that a storm may be surely predicted by its movements, for it is then tossed about and violently agitated on the side of the glass nearest the quarter from whence the wind will blow. This part of the tale I may say is purely fictitious and imaginary; but it is quite possible to prepare a solution of camphor which shall act as a hygrometer in very wet weather. Its behaviour, as above indicated, is due to the fact that camphor is soluble in alcohol but not soluble in water, nor in very dilute alcohol; the other salts of the mixture absorb moisture when exposed to damp air, and it is possible to balance the mixture so as to disturb the camphor precipitate by a small addition of mositure absorbed from the air by the mixture.

As there have been some inquiries about those storm-glasses, I have thought that a paper on the subject would interest readers of AMATEUR WORK; and to keep up the illustrated character of the journal, I herewith append a sketch of a design which incorporates the little house with its John and Joan couple, the flowers and leaves painted with the chloride of cobalt solution, and the storm glass combined in one. In the design it looks very much as if I had been attempting a pictorial libel on Policeman X and his relations with the *area belle*. I beg, however, to assure every member of "the force," who may happen to be a reader of this Magazine, that nothing whatever of the kind is intended, although the mute evidence of the picture is certainly not in my favour.

An ordinary test tube is made to form the centre pillar of the structure, this contains the camphorated solution for the storm-glass. The foot may be moulded in plaster or in paste-board, and the top covered with a bit of bladder tied over the mouth, this part will pass up behind the apparent top of the pillar and will terminate in the box of flowers above. Behind this pillar will be erected the flagstaff, from which depends the fiddle-string to support the light chip platform on which John and Joan stands. This fiddle-string must fit tightly in the cap of the flagstaff and be secured there, but it must be free to move from this point downwards. As it may wriggle about and destroy the balance of the platform, we pass it through the hole in a reed or grass stem glued to the flagstaff from a point just out of sight down to the platform. This must be well balanced when the little figures are on it, and to ensure free movement the flagstaff must not be brought down to the floor of the house, but the platform suspended under its end. When John or Joan fail in their duty—which they will sometimes do—we must correct the fault at the top of the flagstaff by twisting the knot a little until the erring figure takes its proper place. Such adjustments will be necessitated by a removal of the instrument from a damp room to a dry one, or the reverse. It will be found best to always keep it in a cool dry room instead of on the mantelpiece in the kitchen or in the living room, because it is evident that such rooms are not so readily affected by changes of the external atmosphere, whilst their usually dry air will tend to falsify the instrument altogether. It will be seen that I have sketched the instrument with a flower-box for roof, this is to be filled with paper flowers painted with the chloride of cobalt solution, the drooping tendrils and the leaf ornamentation by the side being also painted with the same. The instrument itself may be made with paste-board glued together, or when a larger and stronger house is desired it may be constructed of thin wood. We may thus have three hygrometers in one, and be able to verify or compare their indications of the weather at a glance.

Whether they will indicate truly or not I cannot say; but this I know, that with the aid of such simple instruments, and a little weather wisdom, village seers will put to shame many savants of meteorology using more pretentious instruments.

Some who may be inclined to make this hygrometer may object to the absence of a sloping roof to cover in the top of the house, and to hide the flagstaff. Such an addition, however, is very easily made, and should be contrived so that it may be removed at pleasure, like the cover of a box. To obviate heaviness of appearance, the square casing may be carried up a little higher than in the drawing, and the top may be brought down over this addition. There must be a gable before and behind; that is to say, the front and back of the part which forms the roof or cover must be triangular in form, and, of course, of exactly the same size and shape, the apex of the triangle being immediately over the central axis of the storm-glass. On these triangles two flat pieces are laid to complete the roof.

WRINKLES FOR AMATEURS.

By VARIOUS HANDS.

MICHAELMAS GEESE and young and succulent sucking-pigs have been spoken of at times by persons of hearty appetite and good digestion, as being rather too much for one but not enough for two. Such a man as this must have been the old Devonshire Squire, who was in the habit of saying that he could, at any time, eat a duck after dinner, and was once induced to lay a wager to that effect to the amount of £5. Now it was well known that if the said *bon vivant* liked one dish better than another, it was a well-hung haunch of venison that would induce him to eat—well, until he had placed a more than ordinary strain upon the buttons of his waistcoat. So, one day the man with whom the old Squire had made the bet, asked him to dinner, and gave him haunch of venison. The cloth was removed. and the guests were proceeding to enjoy the post-prandial port, when a couple of covered dishes were brought in and placed before the Squire. He had forgotten his bet, and looked at them with some degree of wonder, but, when, on removing the covers, he saw a five pound note under one and a well-stuffed duck, the biggest that the poultry yard could yield, under the other, he remembered the challenge and became unpleasantly conscious that his reputation was at stake. "You've taken a dirty advantage of me," he said, turning to his host at the head of the table, whose face was illuminated with a broad grin, "but I'll try to do my best anyhow." He did do his best, for he picked every bone of the duck as clean as a whistle, or a new pin, to use two stock similes, and, folding up the note and putting it into his pocket, proceeded to do his duty to the good old port.

But to return to my starting point, and get round at once to what I am driving at. I have found that many correspondents send me notions of genuine value, which, after the manner of the goose and the sucking-pig, are somewhat too big and too good to be reduced to the more modest type used for "Amateurs in Council," but are not big enough to make separate articles in themselves. For the fitting reception and illustration of these good ideas, I have therefore determined to open a special department under the—I venture to hope—not altogether inappropriate heading, WRINKLES FOR AMATEURS, and I trust that those who are disinclined to write papers of the length necessary to raise them to the rank of separate articles, will be satisfied at finding their excellent suggestions produced therein from month to month, or as often as may be necessary, according to the rate of supply, on the double plea that better justice will be done to them than by relegating them to the necessarily small type of "Amateurs in Council," and that each individual writer will find himself invariably associated with good company.

I.—A FOLDING BOOK-CASE.

[*From A. W. K., Bengal.*]

THE accompanying illustrations show in the fullest possible detail the plan and method of constructing an ingenious folding book-case, which, when folded up, presents the appearance of a box suitable for the conveyance of books when travelling. The sender says, "The idea is, I believe, quite original. I have made myself one exactly as described in plan and it gives me every satisfaction. Should the plan prove satisfactory, I hope to contribute others of a similar kind." Remembering the dictum of Solomon that "there is nothing new under the sun," I am of opinion that it would be dangerous to claim perfect originality for the idea; but the arrangement, nevertheless, is both ingenious and useful, and coming as it does from a distant but most important part of the dominions of our Empress-Queen, the designs and measurements are gladly inserted here, not only for their own intrinsic value, but as showing that AMATEUR WORK has found its way into India, and is taken up and welcomed by wood-workers there as well as at home and nearer home.

The method of construction appears so clearly in the illustration that it is not worth while to take up much space in dwelling on it. It will be sufficient to say that it may be made of ordinary pine, clean and free from knots, and that stuff ¾ inch, or at the most 1 inch in thickness, will be sufficiently stout and solid for ordinary purposes. The pine should be stained and varnished or ebonised. If a more ornamental or more costly material be preferred, oak or mahogany may be used. Plain iron hinges may be used for pine, unless brass hinges and fittings are preferred, but for oak and mahogany the latter should certainly be used.

Fig. 1 represents the side of the book-case when closed—that is to say, when the upper part B is turned down on the lower part A so that the structure assumes the form and appearance of a box. The measurements given are inclusive—that is to say, they include the thickness of the wood of which the book-case is made. The height of the book-case when open is 35¾ inches, when closed, as in the illustration, the height is 22½ inches, the breadth from side to side is 28½ inches, the depth 14¾ inches; the depth at three different parts of the book-case is as follows, namely at *a*, *a*, 7¾ inches, at *b*, *b* 13¼ inches, and at *c*, *c* 9¼ inches. All the figures are on a scale of one-eighth—that is to say, ⅛ inch to 1 inch, or 1½ inches to 1 foot.

Proceeding to Fig. 2, which exhibits the front of the book-case when closed, the part B opens or folds on hinges lettered *a a*, and the part C on hinges lettered *b b*. In Fig. 3 the side of the book-case is represented when open and standing on a table. In this, D represents a board fitting in front of section B, and fastening at the sides with a catch, this board is inserted for the purpose of keeping the books in place when the book-case is being closed or opened. In Fig. 3, the space between the shelves is also shown, the space at E being $10\frac{3}{4}$ inches, that at F, $9\frac{3}{4}$ inches, that at G and I, 8 inches, and that at H, 4 inches. The board C, as is shown here, falls forward and outward, forming a shelf in front of the book-case, and resting on the board D, which is placed below it.

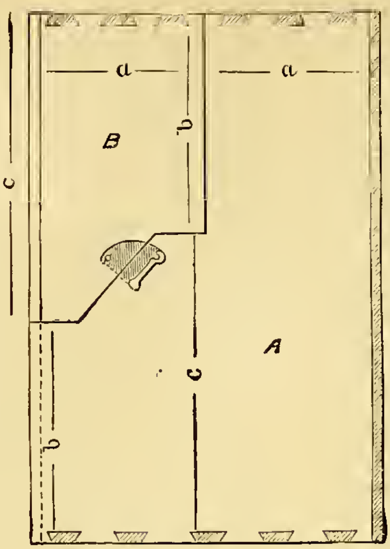


FIG. 1.—SIDE ELEVATION OF BOOK-CASE WHEN CLOSED. Scale, $1\frac{1}{2}$ inches to 1 foot.

The breadth of the book-case, including the sides, was stated above to be $28\frac{1}{2}$ inches, or 2 feet $4\frac{1}{2}$ inches, and the length of each shelf, there being five in all, is 2 feet 3 inches, which leaves $1\frac{1}{2}$ inches for the thickness of the two sides, showing that the case is made of $\frac{3}{4}$ inch stuff, or $\frac{7}{8}$ stuff planed down to $\frac{3}{4}$ inch. The total book room is 11 feet 3 inches, there being, as stated, five shelves, each 2 feet 3 inches long. Supposing the average thickness of the books to be stored in such a book-case to be 1 inch, there is room for 135 books, or speaking in round numbers, from 120 to 150 volumes, according to thickness. The book-case is therefore large enough to contain a choice library of selected authors, and the construction is such that the necessary packing for removal may be effected in a few minutes, the chief part of the operation being merely that of folding up the case.

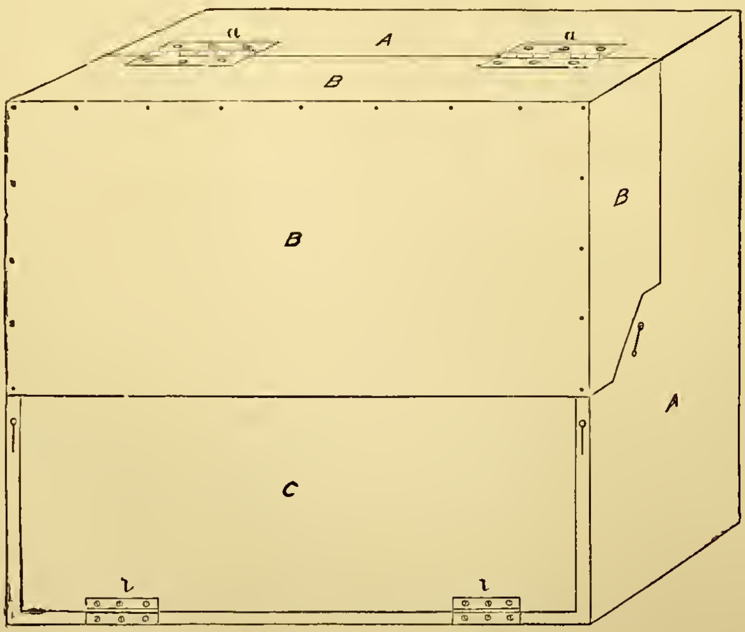


FIG. 2.—FRONT ELEVATION AND ISOMETRICAL VIEW OF BOOK-CASE WHEN CLOSED. Scale, $1\frac{1}{2}$ inches to 1 foot.

For home use a frame may be made, about table height, as a stand for the book-case, the top being so made with ledges surrounding it, that the lower part of the book-case may be dropped into the space surrounded by the ledges on to the frame below. The frame may be suitably fitted with shelves to form a receptacle for china and bric-a-brac.

II.—HOW TO HEAT A SMALL GREENHOUSE.

[*From A CORRESPONDENT*]

A CORRESPONDENT sends the following description of a method of heating a small greenhouse with gas, in the hope that it may be of use to some of the readers of AMATEUR WORK. "I have found it," he says, "most effectual for heating my small house, which is 6 feet 6 inches by 4 feet 6 inches, the height at back being 7 feet 6 inches." It is a pity that he did not give the height in front, as we could then have had complete data for calculating the cubic content of the structure. Assuming the height in front to be 5 feet 6 inches, the mean height would then be 6 feet 6 inches, and the cubic content a trifle more than 190 cubic feet, which is probably very near the mark.

The form and nature of the box and its fittings are shown clearly enough in the accompanying illustration (Fig. 4). The box is made of zinc, with the exception of the top, which is of brass. The gas jet is fitted with

FIG. 8.—AMERICAN DRYER.

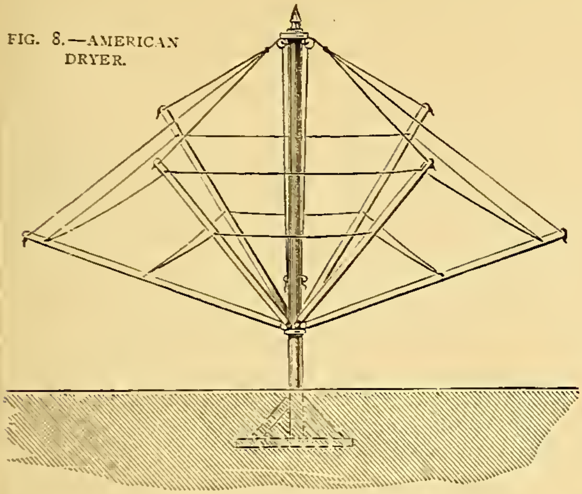


FIG. 4.—APPARATUS FOR HEATING SMALL GREENHOUSE.

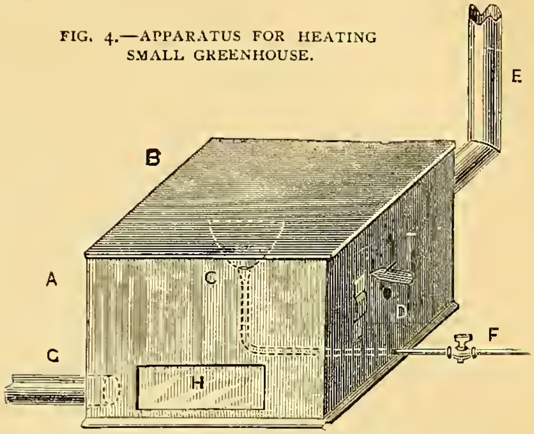
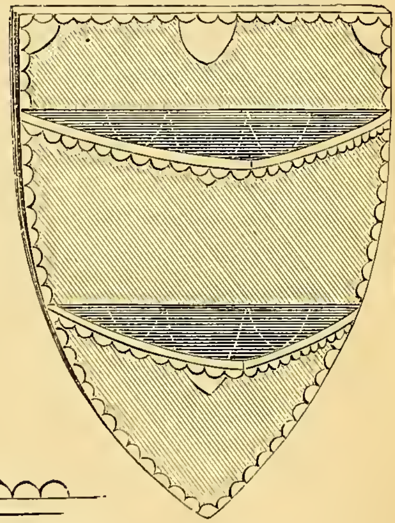


FIG. 6.—BRACKET IN FORM OF SHIELD, ORNAMENTED WITH GUN WADS.



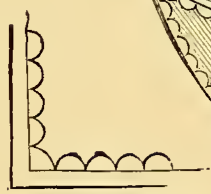


FIG. 5.—MODE OF USING GUN WADS.

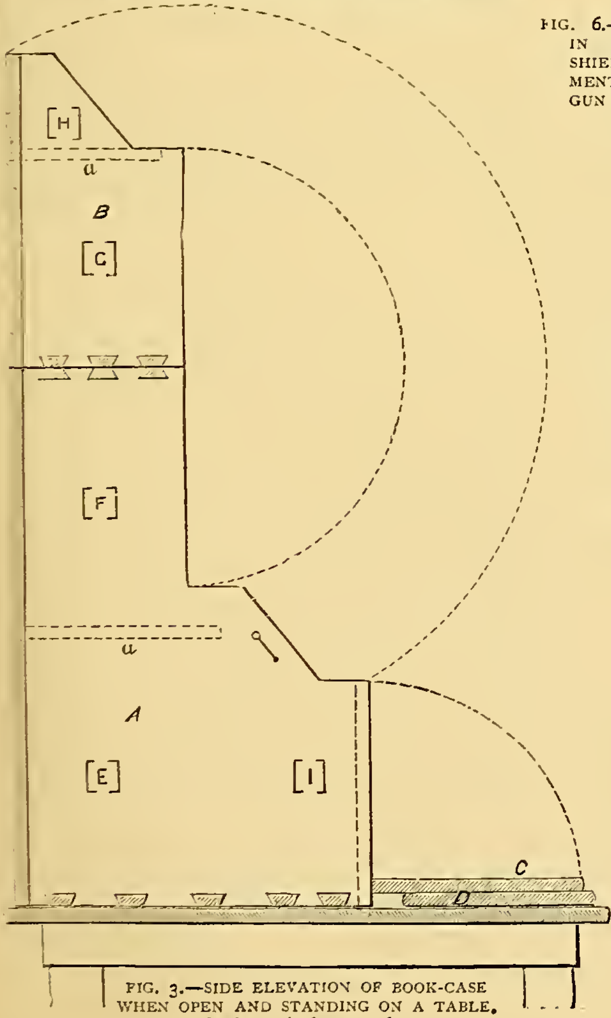


FIG. 3.—SIDE ELEVATION OF BOOK-CASE WHEN OPEN AND STANDING ON A TABLE. Scale, 1½ inches to 1 foot.

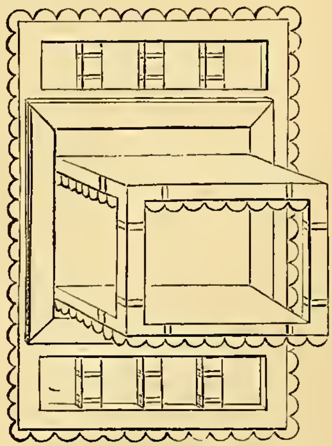


FIG. 7.—DOUBLE BRACKET, ORNAMENTED WITH GUN WADS.

a No. 6. nipple, and it is so arranged and placed within the box that the top of the flame is ½ inch below the top of the box when lighted. In Fig. 4, A is the box, which is 9 inches by 9 inches, and 7 inches in height, giving a cubic content of 567 cubic inches or little less than ⅓ cubic foot. It is useful to know this, because, if a box made in this manner and equal in cubic content to ⅓ cubic foot will heat 190 cubic feet of space, it will take a box ⅔ cubic foot in content, or two boxes of the size described, to heat a space 380 cubic feet, and so on. With regard to the other parts, B is the top of the box, which, as it has been said, must be made of sheet brass; C is a gas jet, fitted, as directed, with a No. 6 nipple, which is suitable for the size of the box. If the box be made larger, the number of nipples or burners must be increased, or a nipple of a larger size must be used. An opening is shown at D for lighting the gas, fitted with a slide, which must be closed as soon as the gas is lighted. E is a pipe to carry away the fumes of the gas and the products of combustion; the pipe is 2 inches in diameter, and must be taken up through the roof or any suitable outlet, into the open air. The pipe for gas supply is shown at F. Another pipe, G, 2 inches in diameter, is brought into the box from the outside, in order to a supply of air necessary for the maintenance of the flame, and a small pane of glass is inserted in one side of the box at H, so that it may be seen whether or not the gas is alight. Heat is diffused through the house by radiation from the sides of the box; and if the box be well made no fume can possibly escape and cause injury to the plants in the house, because the constant influx of fresh air through the pipe G, not only tends to supply air to the flames, but helps to carry off the fumes by forcing the heated and vitiated air in the box into the exit pipe at E. If a moist air be required in the house, this may be effected by placing a shallow vessel—a small baking tin for example—on the top of the box.

III.—A NOVEL USE FOR GUN WADS.

[*From H. B., Aldershot.*]

BEING lately in want of something suitable to ornament several simple brackets that I had made, and which were rather stiff and angular, I was a good deal puzzled how to get curved forms for the purpose. I have no lathe, and invariably make use of such things as I may have lying by, for I make so many odds and ends to ornament my house that I should never stop buying if I once began.

It occurred to me that I had several gun wads that I had never used, and that had been prevented fulfilling their destiny through my lately using filled cartridges. Here was what I wanted. With a razor I cut each fair through the centre (across the diameter, that is), and with these semicircular bits of thick pasteboard I have since got all the ornament that I needed. My brackets were black and gold, and I find these wads take the gold paint very well. They are quite smooth on one side, and quite smooth enough on the edge for all my purposes. I am pleased to tell you of my expedient, for there may be many other amateurs who like their things to cost as little as may be, and whom this suggestion may help in one small matter. My plan is to spread pretty stiff glue on the part needed, and pressing the wads into place leave them to dry. They stick exceedingly tightly. I enclose some drawings of brackets to illustrate my manner of using.

In these, Fig. 5 shows, on a somewhat larger scale than the other two, the method of attaching the gun wads by the part that is cut to the inner edge of a moulding or plain piece of wood. In Fig. 6, which represents a shield-shaped bracket, with two shelves almost in the form of a shield projecting from the back part, the semi gun wads are attached to the lower edge of the shelves, as in Fig. 5, and laid flat round the edge of the back. In Fig. 7, which represents a double bracket, the two shelves being arranged so as to form a kind of box open on three sides, the gun wads are put on edge-wise round the outer edge of the back and underneath each shelf, flush with the edge.

IV.—A SUBSTITUTE FOR CLOTHES LINES.

[*From G. H. SAYER.*]

HAVING seen some descriptions of clothes-horses in AMATEUR WORK, I send a sketch of one called, I think, "An American Dryer." In appearance it resembles the skeleton of a huge umbrella stuck into the ground upside down. When not in use the ribs (six or eight in number) are drawn up by ropes through small pulleys fixed to top ring, so that the whole closes up; and if both top ring and ring to which ends of ribs are fixed are made on the principle of those of a "giant stride," the whole revolves round by the action of the wind on the clothes, which are suspended from the horizontal ropes stretched between the ribs. It is specially adapted for *small* back yards or *limited* garden space, and is, I think, fully within the grasp of any amateur who can do a little simple carpentry. The number of ribs can be increased for a large machine, and the size, of course, must be proportional to space into which it is to be placed. The central pole may be fixed in the ground—indeed, it must be if it be much larger and longer than an ordinary clothes-post—or if small enough and light enough for removal at pleasure, it may be fixed, when in use, in a socket constructed for its reception in a manner similar to those frequently let into the ground to take clothes-posts of the common type, and fitted with a plug when the posts are removed.

THE DULCIMER: HOW TO MAKE IT.

By CHARLES GRAY.

IN the following instructions, I intend to give as clear an account as possible of dulcimer-making, so that any amateur desirous of making one of these sweet-toned instruments can do so, with little trouble and (what is more important to some) with little expense. Of course, it can be done cheaper by buying inferior material; but if the amateur wants the best returns for his trouble and money, let him buy the best material.

With this object in view, let him go to a wood-yard (if he has not the wood on hand), and buy two pieces of good, sound, English oak, clear of knots, 22 inches long, and 3 inches square, for the sides; one piece, 46 inches long, $2\frac{3}{4}$ inches broad, and 2 inches thick, for the bottom; and a similar piece 20 inches long for the top.

Having got the wood to the workshop, commence operations by dressing up the two pieces for the sides. Having got them nicely squared, mark off $\frac{1}{2}$ inch along one side, and bevel the wood down to the mark, the piece will then be 3 inches deep on the inside, and $2\frac{1}{2}$ inches on the outside, see Fig. 1. Both sides must be made perfectly alike. Each end must now be cut aslant, as shown in Fig. 2; to do this, mark off $2\frac{5}{8}$ inches at each end, at the bottom end on the inside, at the top end on the outside; then saw them through to the opposite corner, this will give them the proper slant. The dotted lines (Fig. 2) show the pieces that have to be cut off. I may here state that the bevelled side is for the top side, and will be the only side seen when the dulcimer is finished. The ends must now be cut for the top and bottom to be fixed to them; this is merely a groove 1 inch broad and 2 inches deep. A glance at Fig. 3 will show how this is to be done.

Now prepare the top and bottom pieces, dress them nicely up, and cut them to fit into the sides as tight as possible. Fig. 4 shows the shape of the top and bottom pieces. Now fasten these together with wood pegs, taking them right through from the upper to the underneath side, keeping them clear of where the tuning pegs will fall, E, Fig. 6. This done, take two pieces of oak, 1 inch broad and $\frac{3}{8}$ inch thick, and fasten them to the sides (with wood pegs and glue) to come up flush with the top and bottom, C, Fig. 6, this forms a ledge all round for the belly to rest on. A piece of pine is next required, 46 inches long, 14 inches broad, and $\frac{5}{8}$ inch thick for the back. It must be planed nice and smooth, and then fastened on with screws. The back comes up flush with the outside of the frame all round. Fig. 5 shows the back when put on.

A piece of pine is next required for an inside bridge. This must come up level with, and be let into, the top and bottom pieces; and as it must be underneath the outside bridge, I will now show the proper place for it.

Divide the top and bottom of the dulcimer into five equal parts, and fix the bridge at the end of the third section, counting from the right-hand side, this gives three parts to the right, and two to the left of the bridge; Fig. 6 shows how this is done. Another inside is next required; this will have to be longer than the other, and must be fixed about 2 inches from the right-hand side, B, Fig. 6. Both bridges must be about $\frac{1}{2}$ inch thick, and perforated with holes; two pieces of pine, about 1 inch square and $2\frac{3}{4}$ inches long, with a hole bored down the centre, must now be glued on to the back, 1 inch to the left of the bridge, and one of them $5\frac{1}{4}$ inches from the bottom, and the other $5\frac{1}{4}$ inches from the top, D, Fig. 6. The blocks and the bridges must be level with the top and bottom, so that the belly will rest evenly on the whole of them.

A piece of good, sound yellow, or Swiss pine, is next required for the belly. If it cannot be got $\frac{1}{4}$ inch thick, clear of cracks, get it $\frac{1}{2}$ inch, and plane it down to the required thickness—that is, to be level with the top of the sides when it is resting on the ledge mentioned above, then, about the centre of it, cut out a *f*-shaped hole, about the same size as those on a violin. Before fastening the belly on, continue the holes that are in the blocks, through the back. You can now fasten the belly on, and then bore the holes through the belly from the back side.

We now come to a part that requires a little care—that is, the setting-out and boring the holes for the tuning and standing pegs. The tuning pegs are fixed in the right-hand side, and the standing pegs in the left of the instrument. We will take the right-hand side, Fig. 7, for a pattern. This must be divided into fifteen parts; to accomplish this, make a mark $\frac{3}{4}$ inch from the bottom end, and the same at the top end, divide the remainder into spaces $1\frac{3}{8}$ inch wide; this just takes up the $19\frac{3}{4}$ inches. There will now be fourteen marks, and fifteen spaces. On both sides of each of the fourteen marks, make another, $\frac{1}{8}$ inch from it. Now, evenly between the spaces 2, 4, 5, 7, 8, 9, 11, 12, and 14 (Fig. 7), make two marks $\frac{1}{8}$ inch apart, then draw the lines evenly across, and mark off the places for the holes. Before boring them, go to a piano warehouse, and buy sixty piano screws, you will then know how big to bore the holes, bore them rather less than the screws, as they must fit tight. The dots, Fig. 7, show how the holes should be set out, the pencil lines can be rubbed out after the holes have been bored.

The other side must be set out in exactly the

same manner, so that the wires will run straight and evenly across the instrument.

Having got the holes bored on both sides, give them and the belly a good rubbing with glass-paper, then rub them once or twice with raw linseed oil, and let it dry in. The oak sides may now be either varnished or French polished. The belly looks very well if it is stained to imitate mahogany. The outside of the frame need not be polished, as it is covered with mahogany, after the instrument has been strung up.

The standing pegs must be as long, but they need not be so thick, as the tuning pegs. Any blacksmith will cut sixty of these out for a very trifle.

The pegs may now be put in, and the instrument laid aside till the amateur prepares the bridges, etc.

As the aid of a blacksmith will be required to make the iron bridge, we will take it first. Take a correct measure of it, which is as follows: length, $14\frac{3}{8}$ inches, from top of bridge to bottom of shoulder, $\frac{3}{4}$ inch; from bottom of shoulder to bottom of screw, $3\frac{5}{8}$ inches. A nut will be required for each screw (see Fig. 8). Now make a hole through the top and bottom of the dulcimer, pass the legs of the bridge through them and the two made before, and screw it tight down. As the legs are only $3\frac{7}{8}$ inches long, a piece of the back will have to be cut out; let the nuts in level with the back. The top and legs of the bridge must be about $\frac{3}{8}$ inch diameter.

Now get two pieces of oak, $\frac{1}{2}$ inch broad and $\frac{3}{8}$ inch thick, and the same length as the sides. Make a groove down the middle of each of them, on one of the broadest sides. Round the two corners off, smooth and polish them, and lay them on the belly flat side down, and close to the sides. Now get some brass wire, $\frac{3}{32}$ inch diameter, cut two pieces off $19\frac{3}{8}$ inches long, and lay a piece in each of the grooves. These are for the wires to rest on, so as not to touch the wood.

Now go to a piano warehouse, and purchase 3 ozs. of No. 9, 2 ozs. of No. 11, and 2 ozs. of No. 13 piano wire.

Now commence to string the instrument. To do this, make a loop, Fig. 9, put it on the standing peg, and take the wire to the corresponding tuning peg on the other side, cut the wire about 2 inches past the peg, pass it through the hole in the peg, and then with the aid of the key, Fig. 10, screw it up moderately tight. Put the whole of the wires on like this. When putting the wire on, commence with No. 9 at the bottom, and take it up seven sets; continue with No. 11 for other seven sets, and finish with No. 13, passing those that have only two strings in the set under the iron bridge, and the others over it.

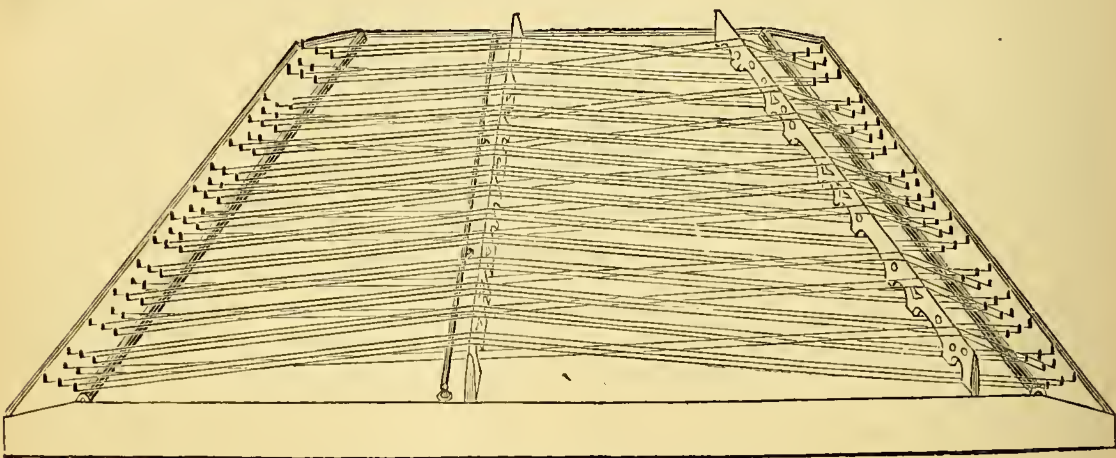


FIG. 14.—VIEW OF DULCIMER WHEN COMPLETED.

Now get a piece of oak, $14\frac{7}{8}$ inches long, 2 inches broad at one end, $1\frac{1}{4}$ inch at the other, and $\frac{1}{2}$ inch thick. This must be rounded off at the top, and a groove run down it for a piece of brass wire to rest in. Now place it on the dulcimer, on the wires, and where the sets of wires fall that have only two in them, there cut out an arch (see Fig. 11). The arches are for the wires with two in the set to pass through, the others going over the top.

The bridge may now be polished and put into position—tbat is, at the end of the third section, counting from the right-hand side, as shown in Fig. 6. Now for the other bridge; this must be 2 inches broad at one end, $1\frac{1}{4}$ inch at the other, $\frac{1}{2}$ inch thick, and $19\frac{3}{8}$ inches long. Now lay it on the dulcimer as before, parallel with the right-hand side, and about 2 inches from it, and where the sets of wires fall that have two in them, there mark off, and leave a foot small enough to stand between the otber wires without touching

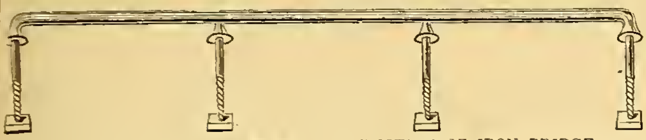


FIG. 8.—DIAGRAM SHOWING CONSTRUCTION OF IRON BRIDGE.

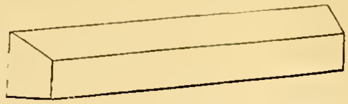


FIG. 1. SIDE WHEN BEVELLED.

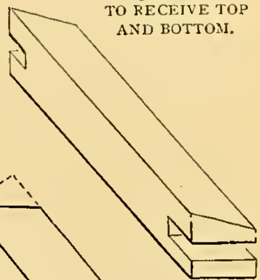


FIG. 3.—SIDE CUT TO RECEIVE TOP AND BOTTOM.

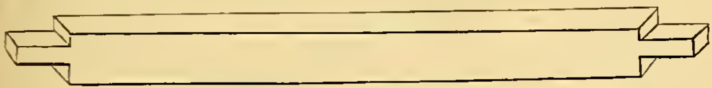


FIG. 4.—SHAPE OF TOP AND BOTTOM.

FIG. 13.—HAMMER.

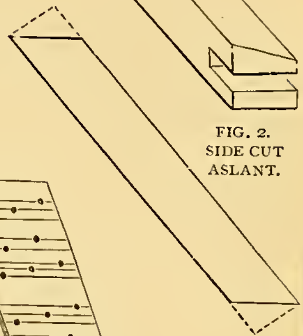


FIG. 2. SIDE CUT ASLANT.

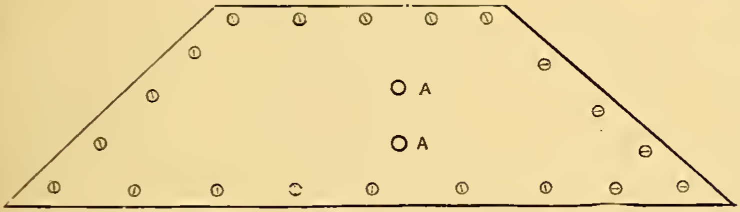


FIG. 5.—BACK. A, A. Holes in back to let sound out.

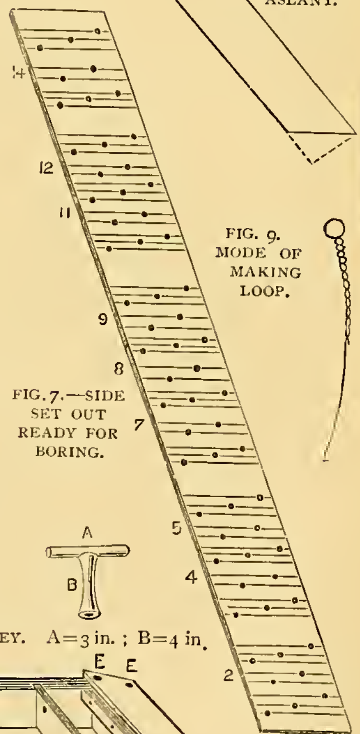


FIG. 7.—SIDE SET OUT READY FOR BORING.

FIG. 9. MODE OF MAKING LOOP.

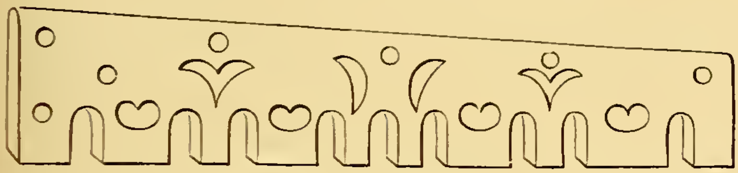


FIG. 11.—MIDDLE BRIDGE.

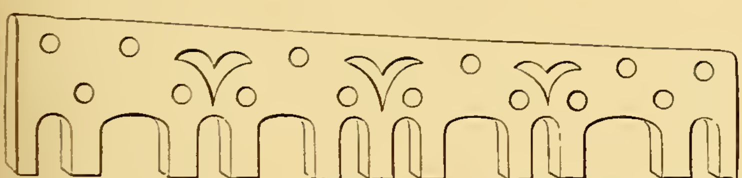


FIG. 12.—RIGHT HAND SIDE BRIDGE.

FIG. 10.—KEY. A=3 in.; B=4 in.

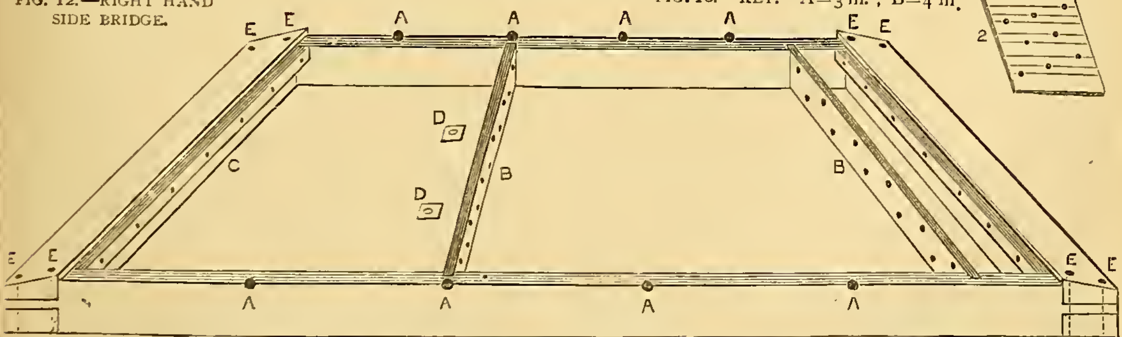


FIG. 6.—FRAME OF DULCIMER. A, A, shows division into five parts. B, Position of Inside Bridge. C, Pieces fastened on to sides to complete ledge for Belly to rest on. D, D, Blocks of wood glued on to back for legs of Iron Bridge to go through. E, E, Wooden Pegs to fasten joints.

them; the rest may be cut out to form arches (see Fig. 12). The sets of wires with two in them pass over this bridge, and those with three in the set through the arches. The instrument is now fit for tuning. It must be understood that the broad end of the bridges are for the bottom end.

The tuning of the instrument to some will be the most difficult part; but if the amateur can get access to a piano, let him set the bottom set of strings to the tone of the highest A in the bass part, and continue it up to the top, same as the piano, the three-stringed sets for the natural tones, and the others for the half-tones. If the middle bridge is set correct, the strings on the left hand of it should be four notes higher than those on the right of it; that is, when the bottom set on the right-hand side sounds A, the same set on the left-hand should sound E, and unless it does this, the bridge is not set true. If he cannot get the use of a piano, let him get a tuning-fork, and a little practice will soon enable him to tune it correctly.

When I first made one, I could neither tune nor play it, but I was determined to do both, and, after a little practice, succeeded.

Each string in the set must be toned exactly alike. The instrument is now fit for casing round the outsides. It can be done with white wood, and stained; but mahogany makes the instrument look better. There will be four pieces required; measurement is useless, as you have the instrument to measure from. Let them stand up about ¼ inch above the top of the dulcimer all round, and trim the edges off. Smooth it nicely, and polish it.

All that is now required is a pair of hammers to play with. To make this, get a piece of cane about 7 inches long, split it down the middle, and then thin them until they spring nicely. Now get two pieces of cork, a piece the width of the cane, cut from the end of a bottle cork, and then cut in two, will do; fasten these to the pieces of cane, cover them with a piece of washleather (Fig. 13), and you have your instrument complete. With the exception of the feet and arches of the outside bridges, the amateur may cut them out as he pleases; I have merely made the holes, etc., for a pattern. I got a blacksmith to make my key. When ordering one, mind and take a tuning-peg with you, as the blacksmith will require it to make a hole in the key with. Should any amateur, after he has got his instrument finished, desire a stand for it to rest on, I shall be happy to give instructions and illustrations for making one.

In the foregoing instructions it has been my chief aim to point out everything as clear as possible, and I trust that any of my brother amateurs who may commence to make one will be able to finish it without difficulty, and with satisfaction to himself.

OVERGLAZE PAINTING ON PORCELAIN.

By AURELIO DE VEGA.

II.—WARE—BRUSHES.

12. APPARATUS. — The materials and appliances which the painter will find it necessary, or at some time or other advisable, to use are as follows:—

1. Earthenware or porcelain articles, either white or of one uniform colour.
2. Brushes.—Camel-hair and sable.
3. Mediums or vehicles.
4. Vitrifiable pigments or enamel colours.
5. Pallet and receptacle for mixed colour.
6. Pallet knives, steel and ivory.
7. Pieces of linen rag free from lint.
8. A painting table.
9. Slab and muller.
10. Pointers or scrapers.
11. Rests for arm and hand.
12. Horizontal wheel.
13. Easel.
14. Burnishers.

13. *Essentials.*—It is essential that the articles numbered 1 to 8 should be sufficiently represented at the outset in the beginner's stock, the others may be obtained as the need for them arises. I say this thus early because I know that some have a weakness for getting, and others are deterred from entering upon a new course by the thought that they ought to get, a complete set of everything that may be, however remotely, useful. The first class then become discontented on account of their unproductive outlay, the second deprive themselves of the possibility of much pleasure. It will amply suffice to start with a single plate or tile, two or three brushes, two mediums, a couple of colours, a pallet, a pallet knife, and a bit of rag. There is further a great advantage in having a limited stock in hand, for the beginner is thereby saved the temptation, too often irresistible, to enter upon work for which he is not yet qualified.

14. I may be permitted to remark too here at the beginning that the whole of the following information is founded upon notes made of the difficulties experienced and obstacles encountered by beginners, and it will be noticed that occasionally I shall have to correct procedures which I have found to be recommended by others but which I have proved to be erroneous.

WARE.

15. With regard to the ware, an indication has already been given (§ 11. page 21, Vol. II.) of the principal articles in which the amateur may most advantageously invest for decoration. I may here

enter more into detail and give some particulars as to prices. Under this heading I propose to give some prices and sizes of earthenware as well as of porcelain. My reason is that on earthenware, if good, as it may be procured at the houses which will be mentioned, some good work can be done, and it is very much cheaper, and in a large number of cases quite satisfactory, for the student to practise upon. Earthenware, however, as a class, is softer than porcelain, and will not in general stand the repeated firings required by elaborate work, which I trust those who follow me will eventually produce, and for such work the best and most perfect porcelain procurable will not be too good.

16. *Tiles.*—The most serviceable articles for the beginner to practise upon are the thick earthenware tiles glazed on one side, and these are at the same time most generally obtainable, and from their fair quality, good glaze, and extreme cheapness, most acceptable to the tyro. They are ordinarily made square in sizes from 4 inches upwards. Prices, 4 inches, 4d.; 5 inches, 5d.; 6 inches, 6d.; 8 inches, 9d. to 1s. These are the most useful sizes. The prices of the larger sizes vary considerably. According to one list by me, Minton's 9 inch tile is 2s. 6d., and his 12 inch is 6s. For work requiring such a size it might be possible to employ some other shape or make.

These square tiles are best adapted for stoves and mantel-pieces, or for walls, the painting on each tile either being a design complete in itself or forming part of a large picture. Generally they may be used for insertion wherever weight is not material.

17. *Plaques of Slabs.*—There are also thin, oblong, or square, or round or oval slabs or plaques glazed on one of the sides or on both. These are finer, and more suited for inlaying in cabinets, sideboards, thick book covers, such as the covers of albums or of books for, say, a collection of photographs of choice works of art, and generally where comparative lightness is an object. For test tiles those glazed on both sides are particularly serviceable, as they may be painted on both sides, and so a large number of bought colours and private mixtures may be got together in a small space. Messrs. Kennedy & Brown, of 17, *Oxford Street, W.*, have furnished me with these dimensions and prices for ordinary earthenware. The prices are stated to be the regular trade charges. 5 inches, 10d.; 6 inches, 1s.; 7 inches, 1s. 3d.; 8 inches, 1s. 6d.; 9 inches, 2s.; 10 inches, 2s. 3d.; 11 inches, 2s. 9d.; 12 inches, 3s. 3d. each.

Messrs. Hancock & Sons, of *Worcester*, issue a special make, in round, oval, or oblong shapes. 4 inches, 1s.; 6 inches, 1s. 3d.; 8 inches, 1s. 10d.; 10 inches, 2s. 9d.; 12 inches, 4s. 6d.; 14 inches, 7s. In oblong plaques the above measurements will be the length. These prices are for white and ivory. This ware is specially adapted to the wants of the amateur ; at the same time it is necessary to state that, through the operation of several causes, he cannot now be certain of getting the real article except by direct order to the firm.

Earthenware plaques and tiles, tinted in one uniform colour, may be had, in most cases at an increased cost.

In porcelain the price is very much greater, a 4 inch by 2½ inch plaque being about 15d. or 18d. ; a 6 inch by 4 inch about 2s. 6d.; and 8 inch about 5s.; and a Minton's 12 inch is a guinea ; so that above a certain size the value increases in about geometrical ratio.

18. *Dishes and Plates.*—These may be had in all sizes and either round or oval. The plates may be had either of uniform thickness so that either front or back may be used (Fig. 1), thus presenting both a concave and a convex painting surface, or with a rim on the convex side like that on a dinner plate (Fig. 2), through which holes are already or may be bored for hanging cords, which are preferable to the wire plate-holders. Either shape may be equally suitable for landscapes. The oval are on the whole rather better for seascapes, and the circular for heads, fruit, flowers, etc.

FIG. 1.—SECTION OF PLATE GLAZED FOR PAINTING ON BOTH SIDES.

FIG. 2.—SECTION OF PLATE TO BE PAINTED ON CONCAVE SIDE, WITH PIERCED RIM AT BACK.

FIG. 3.—SECTION OF DISH.

Messrs. Kennedy & Brown's prices are as follows : 12 inches, 3s. ; 14 inches, 4s.; 16 inches, 6s.; 18 inches, 9s.; 20 inches, 12s. 6d.; 22 inches, 22s. 6d.; 24 inches, 27s. 6d.

Messrs. Hancock & Sons publish the following list: 8 inches, 1s. ; 9 inches, 1s. 2d. ; 10 inches 1s. 6d.; 11 inches, 1s. 8d.; 12 inches, 2s. 2d.; 13 inches, 2s. 8d., 14 inches, 3s.; 15 inches 3s. 9d.; 16 inches, 4s. 6d.

The prices given are for earthenware. In porcelain, an ordinary sized new pattern dessert plate (Fig. 2) of excellent quality may be had for 2s., larger sizes proportionately dearer. It will often happen, however, that at ordinary china-shops very servicable, plain china-ware may be obtained cheap, although most, if not all, of it will have a rim like a dinner-plate. Still this rim is, in many cases, highly useful as serving for a ledge on which a border may be painted.

19. *Cups and Saucers, Vases, etc.*—These in porcelain form very pleasing ornaments, and are made now in a great variety of shape. Most of these shapes, however, are adapted to ornamentation rather of the

symmetrical kind than of any other ; but there is one shape which I have come across, and is so admirably suited to any sort of treatment, bird, flower, land, or sea-scape, and a pair of which, when well decorated, look so well in a cabinet, or in a what-not, that I particularly mention it. It is called the Cabinet shape ; has an oblong body, with four flat rectangular sides, and depresssed, rounded corners. Saucer to match, and flattish. It is issued by the Crown Derby Company ; price, small, 2s. 9d. ; large, 3s. 6d. Toilet services and candlesticks also offer a large scope for decorative skill.

20. The foregoing London houses are centrally situated. Towards the west are Messrs. Mortlock and Sons, 466, 468, and 470, *Oxford Street*, and Messrs. Goodes, 17, 18, and 19, *South Audley Street*, who keep large stocks, but are not unfrequently dearer. Those of my readers who live south of the Thames will be glad to know that a large and varied stock may generally be found at Mr. Penhey's, *Vauxhall Cross*, and when it is stated that he selects his goods from the stocks of some of the best makers, named in § 6 (c), and that he supplies the students of the School of Art, *Upper Kennington Lane*, it is unnecessary, having regard to the high character of that school, to add anything. The prices are very moderate.

21. *Foreign Ware.*—To those who propose trying the softer French ware, I may mention the houses of Messrs. Lechertier, Barbe, and Co., 60, *Regent Street, W.*, and Messrs. Brodie and Middleton, 79, *Long Acre*, the former particularly for china, flat oblong plaques, and slightly convex oval ones, and the latter for some vases and cups of delicate substance and pretty shape. The medallions referred to are very suitable for portraits in vignette style, or for *bijou* work for setting in bracelets, lockets, etc., as well as for inlaying. The following is a selection of the prices of these :—

in.		*in.*	*s.*	*d.*	*in.*		*in.*	*s.*	*d.*
1	by	$\frac{7}{8}$	0	3	$5\frac{1}{2}$	by	$3\frac{3}{4}$	1	6
to 2	,,	$1\frac{5}{8}$			$5\frac{1}{2}$	,,	4	1	9
$2\frac{5}{8}$	,,	2	0	4	$5\frac{7}{8}$	,,	$4\frac{5}{8}$	2	2
3	,,	$2\frac{3}{8}$	0	7	$6\frac{5}{8}$	,,	$5\frac{1}{8}$	2	6
$3\frac{1}{2}$	,,	$2\frac{3}{4}$	0	9	$6\frac{7}{8}$	,,	$5\frac{1}{8}$	3	0
$4\frac{1}{4}$	,,	$3\frac{3}{8}$	0	11	$7\frac{5}{8}$	,,	$5\frac{1}{2}$	4	0
$4\frac{5}{8}$	,,	$3\frac{1}{4}$	1	0	$9\frac{7}{8}$	,,	7	7	6
					$11\frac{5}{8}$	,,	$8\frac{3}{8}$	10	6

Some may like to try their hand on the hard French or German ware. For unpainted pieces, I would suggest application to some of the foreign houses in the neighbourhood of Holborn Circus. Mr. Joseph Roth, 11, *St. Andrew's Street, E.C.*, may be mentioned as a large importer.

22. I may mention in this connection that as regards plain ware of the firms named in § 6 (c), specimens cannot always be obtained retail by the amateur himself direct from the makers, some of the firms, such as the Worcester Company and Messrs. Brown Westhead, declining to sell in that way ; but I understand that pieces can always be procured through a dealer in chinaware who purchases pretty largely.

23. *The Ware must be Free from Defects.*—Finally, be careful to see that your ware is not cracked, or floored, or chipped, especially at the edges. If cracked, it would probably go to pieces during the firing. Flaws might be difficult to hide. Little holes are treacherous ; they serve as catchpits for colour, which may blister in the muffle, and spoil the work. Ware, the glaze of which is scratched, should also be discarded if delicate work is to be done, as the scratches collect the paint. On a chipped edge, good lining or banding cannot be done. New ware that is free from these defects is the best ; and, as a rule, the best ware stands most firings.

BRUSHES.

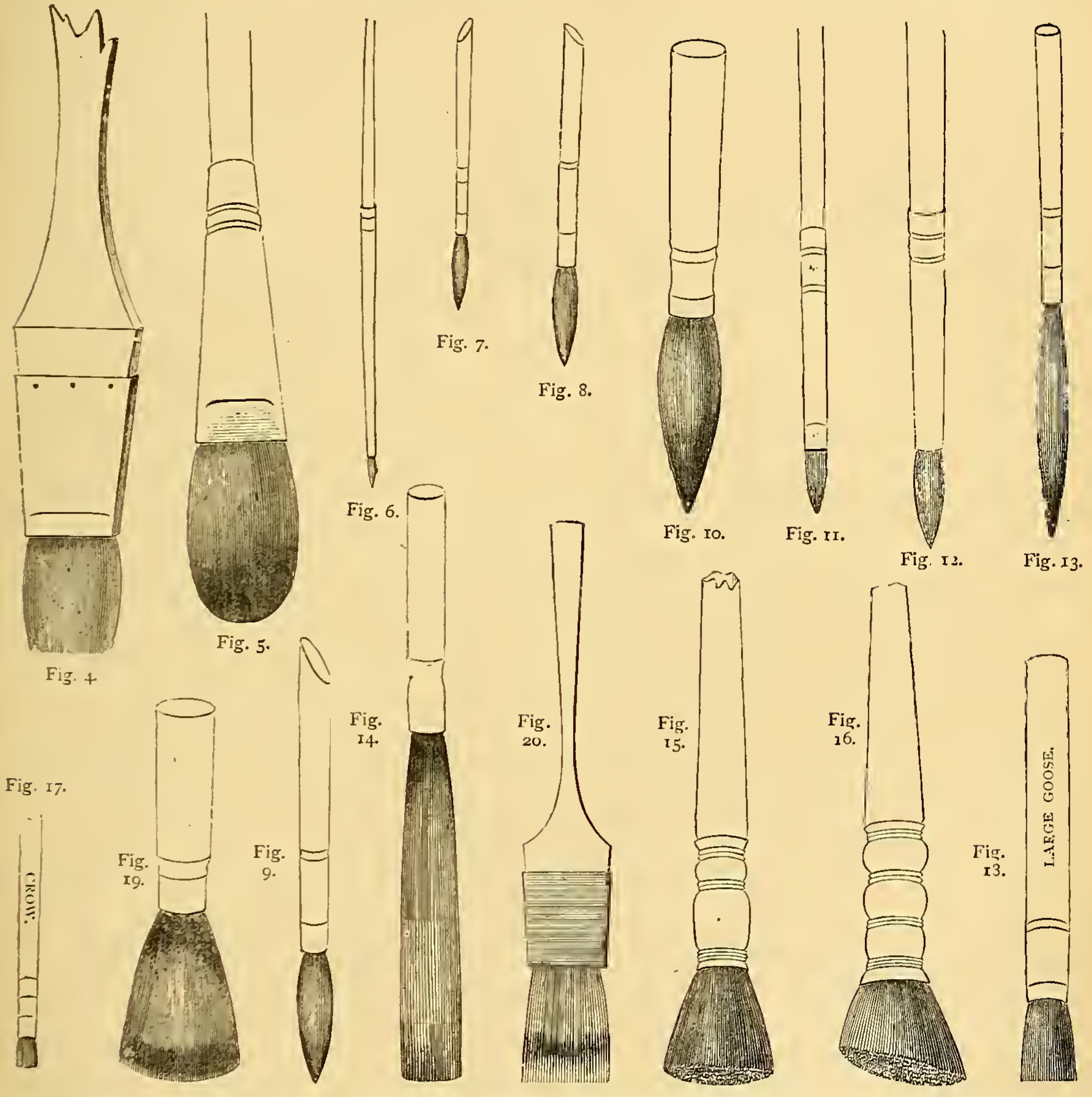
24. *Material.*—The brushes will be made of either camel-hair or sable. Much difference of opinion exists as to which kind should be used, many regarding the former as answering all requirements, others contending that to produce the best work only the latter should be employed. This procedure is something like the act of the Chinaman who burnt down his house in order to roast his pig. To employ only sable where camel-hair will answer as well, if not, as I think, better, is as expensive comparatively as it is unnecessary ; and unnecessary, experience shows it to be in by far the greater portion of the work. The right course undoubtedly lies between these two extremes, and is to use the kind best adapted to the particular work in hand at the moment. I therefore recommend an assortment of each.

25. *Special Work for Camel-hair and Sable.*—For work requiring breadth of treatment, washing in surfaces, large or small, there is an advantage in the use of camel-hair, which, owing to its greater pliability and softness, is better adapted to leave an even and equal layer of paint upon the surface of the ware. For firm, sharp, or fine and delicate touches, however, sable will be found more useful, in consequence of its greater spring. Accordingly, we should use *camel-hair* for skies, grounds, still or nearly still water, trunks of trees and masses of foliage, petals of flowers and leaves of plants, the bodies of birds and the first washes of fruit, faces, draperies, and such like ; while our *sable* we should take up for all firm outlines, in giving definition to stones and waves, in markings of trunks and in determination of foliage, in drawing pistils, stamens, and seeds, and bringing out leaf-markings, in delineating the features, and generally in all work requiring particular clearness or crispness. No doubt much excellent work, particularly in the way of practice, may be done with camel-hair alone ; but for finished work,

the judicious employment of both kinds will help in producing the most gratifying results.

26. *Testing Brushes.*—Whatever kind may be selected, the best only of that kind should be used. It is impossible to produce a highly-finished work with bad tools. In a good brush, when dry, the body is perfectly elastic, and the hairs have a perfect spring, and lie equally together.

A brush should not be purchased without having been tested. Always test your brushes in water. If the seller does not proffer the jar of water, ask for it; if he does not produce it, do not buy. The water forthcoming, dip the hairs in it so that they become fully charged. Then holding the handle tightly between the ends of the thumb and second finger, suddenly depress the latter, retaining the brush between the thumb and the first finger. This jerk will send off the superfluous water, and then the brush, if good, will at its end present, if a round or small flat one, a fine point, if a large flat one, a fine, straight, or



BRUSHES:—FIGS. 4, 5.—WATER OR SKY, WASHING IN OR GROUNDING BRUSHES. FIG. 6.—00 MINIATURE SABLE. FIG. 7.—SMALL FINISHER, CAMEL HAIR. FIG. 8.—SMALL ROSE, CAMEL HAIR. FIG. 9.—SPECIAL ROSE, CAMEL HAIR. FIG. 10.—LARGE SHADER, CAMEL HAIR. FIG. 11.—FLAT SHORT SABLE. FIG. 12.—ROUND ORDINARY SABLE. FIG. 13.—FOR LINING OR TRACING. FIG. 14.—BANDER. FIG. 15.—DABBER, FLAT TOP. FIG. 16.—DABBER, SKEW TOP. FIGS. 17, 18.—SUPERFINE FITCH HAIR BRUSHES. FIGS. 19, 20.—SOFTENERS.

slightly-curved line, to which, in either case, the body has *regularly* decreased. If a round brush should, after this test, have protruding hairs in the body, or free hairs at the end, or a flat one have some parts of its line thicker than others or depresssed, or the terminating point or line be not led up to gradually, reject it without further consideration, it is not a good brush.

Cautions.—(*a.*) A common test is to moisten the brush slightly in the mouth, and draw the hairs together through the lips. This is a procedure giving most uncertain results, not to mention an obvious objection to it. In a brush not absolutely worthless, but a long way from being thoroughly useful, the stickiness communicated by the saliva would impart to the hair-tips a certain amount of cohesion, causing a point which under the proper test would never form.

(*b.*) One further caution is necessary, and is addressed rather to those living in the country. It may be that a piece of work is in hand which it is desired to finish quickly, but through some accident the suitable brushes have become useless. For convenience, application for new brushes is made at the nearest shop professing to sell artists' materials. Now, a good many of the small and pretty numerous shops which make this profession act up to it, and at them serviceable tools may be obtained; but others, I am sorry to say, do not, and at these one may meet with brushes already presenting a very good point, which, alas! is more frequently than not the result of the addition of a little mucilage to the water with which the hairs have been moistened. In this case the hairs are a trifle harsh and stiff. If you cannot conveniently search elsewhere, rub the brush between the fingers to remove the powder, and test with water as above suggested. A good one may possibly be found among the lot.

27. *The Shape and Size of the Brush to be employed.*—These particulars will depend upon the nature of the work and the extent of the surface to be covered, and hence there is great variety in these respects.

(*a*). *Skies, Water, and Grounding.*—For skies, and water in which there is a pretty large sheet of colour, either of one intensity or graduated, and to be left as laid, or to have the clouds or lights picked out, a flat brush, as shown in Fig. 4, is generally about the best; but in smaller or somewhat irregular work, that shown in Fig. 5, which is often called a sky brush, is perhaps most serviceable. The size should be such as to allow of enough paint being taken up to give a complete line of full width. Fig. 5 is also well suited for washing in large masses of foliage. Either brush answers well for back-grounds or ground-laying.

Prices,—Fig. 4, camel-hair : $\frac{1}{2}$ inch wide, 4d.; $\frac{3}{4}$ inch wide, 5d.; 1 inch, 6d.; $1\frac{1}{4}$ inch, $7\frac{1}{2}$d.; $1\frac{1}{2}$ inch, 9d.; $1\frac{3}{4}$ inch, $10\frac{1}{2}$d.; 2 inches, 1s. Fig. 5, Siberian hair : $\frac{3}{8}$ inch, 6d.; $\frac{1}{2}$ inch, 8d.; $\frac{5}{8}$ inch, 10d.; $\frac{3}{4}$ inch, 1s.

(*b.*) *For General Use in the ordinary run of Painting*, the brushes or pencils depicted in Figs. 6 to 12 will be found most serviceable, the sizes varying according to the size of the work in hand. Fig. 6, an extremely fine sable, is for the most delicate work in the features of small faces, such as nostrils, lips, the iris, etc. Figs. 7, 8, and 9, in quills, are a special make of Messrs. Hancock and Sons, and are of sizes very generally useful. Fig. 10, and a size or two smaller than that represented, are useful in large shading, such as broad draperies in big paintings, and in foregrounds. Fig. 11 is a shortish, flat sable, highly useful in giving crisp touches with paint rather stiffer than usual. Fig. 12 is an ordinary round sable. Both these last are in metal settings. With regard to the difference between round and flat brushes, it may be stated that the latter are often a little more useful in a skilled hand, as a greater variety of stroke and touch can be given with them. This point will be further noticed by and by. Both sables and camel-hair may be obtained in quills or set in metal or albata. The first are the cheapest, and are of excellent quality. The last, no doubt, look best, and in the very small sizes are rather preferable, as greater care is supposed to be taken in the fixing, etc., of the hair. The metal does not corrode.

Prices.—Flat red sable in metal : Size 2., 6d.; 4, 8d.; 6, 10d.; 8, 1s. 6d.; 9, 2s.; 10, 3s. Round red sable in metal : Size 2, 6d.; 4, 8d.; 6, 10d.; 8, 2s.; 9, 2s. 9d.; 10, 4s. Round red sable in quill : miniature, 4d.; crow, 4d.; duck, 5d.; goose, 8d.; large goose, 1s. 6d. Camel-hair : Fig. 7, 1s. per dozen ; Fig. 8, 8d. per dozen ; Fig. 9, 10d. per dozen ; Fig. 10, 2s. and 3s. per dozen.

(*c.*) *Liners, Tracers, and Banders.*—Fig. 13 represents a brush known as a liner. This has very long hair, and is a fine and very supple brush, capable of holding, for its diameter, a very large quantity of paint. This is a necessity met by the length, as otherwise the point would be likely to dry. It is used for drawing circular lines round plates or vases, and may be had in three or four sizes. A somewhat similar brush, with shorter hair for the same diameter, is made for tracing and drawing outlines. With a little practice either answers very well for the other. Fig. 14 also comes into use in circular work, and with it bands of colour are described. The possession of it is not, however, an absolute necessity, as with experience a large liner can be made to do its work. These brushes sbould be of a size that when well filled will enable the painter to do a complete circle, whether line or band, without stopping to have to replenish the brush.

Prices.—Camel-hair : Liners, 1s. and 1s. 6d. per

dozen ; Tracers, 1s. and 1s. 6d. per dozen ; Banders, 1s. 6d. and 2s. per dozen.

(*d.*) *Dabbers.*—The foregoing are brushes used in actually laying the paint on the ware. There are others required for distributing it *when such an operation is necessary*. These are Fitch brushes, or Dabbers, and Softeners (see Figs. 15 to 20). The former are employed to render even a coat of paint which it is perhaps impossible, owing to irregularities in the surface of the ware or from some other cause, to lay quite flat with the painting brush. The large ones are in two shapes. The flat-headed ones are for use on flat or convex surfaces, such as the middle portion of plates and dishes, and the round of vases, etc. Those with a skew top, which is slightly convex, are for concave parts, such as mouldings of plates and other hollows. These two kinds are for ordinary work. The small fine ones set in quills are for more delicate work.

Prices.—On wood : Flat, 5d., 8d., 10d., 1s., 1s. 3d., 1s. 6d. each ; skew, 8d., 10d., 1s., 1s. 3d., 1s. 6d , 2s. each. In quills : lark and crow, 2d. each ; duck, 3d. each ; goose, 4d. each ; large goose, 6d. each.

(*e.*) *The Softeners* are brushes with very fine and soft hair, and, as their name implies, are used in softening tints and rendering them more delicate, and are most serviceable in such work as toning down the edges of clouds, producing graduated tints which vanish or mingle, one can scarcely see how, and often subsequently to the dabbers, to secure an evenness which they may fail to produce, and for which other processes that we shall have to notice, are unavailable. These are made in badger and camel-hair, the former being a most excellent kind, and round or flat. Fig. 19 shows a round camel-hair by Hancock, Fig. 20, a flat badger. Prices, badger, round, 6d., 8d., 10d., 1s., etc., according to size. Flat, $\frac{1}{2}$ inch, 9d. ; $\frac{3}{4}$ inch, 1s.; 1 inch, 1s. 4d.; $1\frac{1}{4}$ inch, 1s. 8d.; $1\frac{1}{2}$ inch 2s., and up to 6 inches. Camel-hair, 3d., 4d., etc., each ; $\frac{1}{2}$ and $\frac{3}{4}$ inches are the most generally useful.

The above mentioned prices are for the most part from the catalogue of Messrs Middleton & Brodie.

28. *Cleaning* (*a.*) *Procedure.*—It may seem an excess of caution, not to say an impertinence, to urge the observance of cleanliness with regard to the brushes ; and yet experience shows that it is absolutely necessary to do so, and in the strongest terms. Cleanliness is needful in everything connected with china painting, but in no department is it more so than in the treatment of the brushes. Many a good brush is ruined either by letting paint harden in it past the possibility of entire removal all at once, or by injudicious treatment after paint has dried in it. To prevent the occurrence of this condition, one course is obvious : do not let the paint harden in your brushes. Those you have used during the day, clean when the day's work is done. While they are moist the labour of cleaning is not worth mentioning, and the time the cleaning will occupy is but short ; if postponed till the morrow, both will have increased. The brushes will be cleaned in turpentine. Ordinary turpentine, such as is procurable at oilshops, will do quite well, provided it be fresh and not oily. In cleaning up, as in everything else, there is a right and a wrong way. If you wish to spoil your brush, to cut the hairs or make them stick out like an Aztec's or become curly like a negro's, you will dab it down perpendicularly on to the bottom of the little dish or vessel containing your washing turpentine, but if you would retain it serviceable until fair wear and tear alone renders it otherwise, you will clean it by holding it in the turpentine slantways, at the angle at which a pen is ordinarily held in writing, and will turn it on either side, gently pressing it against the vessel so as to squeeze out the paint. The same turpentine will clean several brushes if the paints in them are allied in composition, as to which we shall speak in due course. The plan I adopt, and which I have found economical, is to have a slant tile with three divisions ; put a little turpentine in each, wash each brush singly on the higher part of the first slant, and when pretty free from paint draw it along a clean piece of rag and put it on one side. It will be found that the paint sinks to the lowest part of the slant. When all are washed once, repeat the process in the second slant. If the cleaning has been thorough, the turpentine in the third slant will not be at all tinged. It is necessary to state that a trace of one colour in a brush may be sufficient to spoil another with which such brush is used. Some colours wash out less easily than others ; thus, blue is rather persistent, while pink is very easily disposed of, and this consideration indicates the advisability of employing different sets of brushes for colours of different classes, which are mutually antagonistic.

At the same time a slip may happen with even the most methodical, and a brush may escape notice when the rest are having their bath, so that when discovered next day or so the paint has dried somewhat. Now in such case do not on any account bend the hairs to try and soften them, as doing so will not effect the desired purpose but may break the hairs and spoil the brush. The proper way is to let it soak in turpentine for a moment, then hold it in front of a fire, or by the side of, *not over*, a gaslight until it softens. You will then be able to wash it in the ordinary way. If through the heat the turpentine has evaporated before the brush is soft, recharge the brush and hold it to the heat again.

It may be added that an occasional mild application of a little soap and water (without soda) is beneficial to the brushes. It should be administered but

seldom, however, as frequent dosing results in spreading and curling the hair.

(*b.*) *Caution.*—In one little book on this subject I find that the student is recommended to have at hand a little bottle of *spirit of wine* in which to clean the brush, probably because this liquid is such a solvent for oils. It does too much, however, in one respect and not enough in another, for it runs the oil out, leaving behind the whole, or almost the whole, of the paint in clots or fine needles closely adherent to the hair and difficult to thoroughly remove.

29. *Receptacle for Brushes.*—If the brushes are, as they should be, kept in a separate box, say of cardboard, care should be taken that the box is somewhat longer (about a couple of inches) than the longest brush in it, and that when the brushes are put away the hairs are not pressed against the end, which would turn the points and render the brushes useless.

In the next paper, Mediums and Paints will be dealt with.

(*To be continued.*)

HOW TO MAKE PICTURE FRAMES.

By H. MILBROOK.

I.—TOOLS REQUIRED: AND HOW TO MAKE AND USE THEM.

PICTURE FRAMES are so easily made, and the tools and appliances required are so few in number, that I think every amateur who has the slightest knowledge of wood-working tools should be able to make his own frames. I shall begin by supposing that the amateur has, at least, a strong bench and a few ordinary carpenter's tools. The first thing required is a proper mitre-board, and this can either be purchased for a few shillings, or made by the amateur. There are, of course, various descriptions of mitre-boards in use, some being far more complicated than others. I shall, however, give descriptions of two of the most simple, and at the same time the most suitable for occasional work. Fig. 1 is made simply of two pieces of either deal or beech wood, A being about 24 inches long, 9 inches wide, and 1 inch thick; and B being of the same length, but 4 inches wide, and 2 inches thick. B should be plained square, and then either nailed or screwed firmly to A, the sides of B being flush with the sides of A; when this is done, the lines C, D, should be carefully marked at the correct angle, 45°, and then sawn through to A. Too much care cannot be exercised in getting these lines exact, as upon their correctness depends the whole success of the mitre-board. Fig. 2 is made in a similar manner to Fig. 1, except that instead of having one strip only at the side, there is a strip at each side, and the lines C, D, are extended across the board, and through each strip, thus forming an additional guide to the saw, and tending to secure the

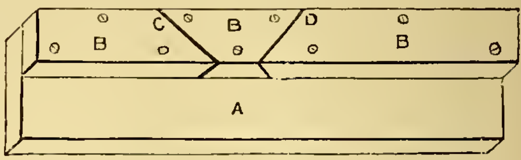


FIG. 1.—SIMPLE MITRE-BOARD FOR FRAME MAKING.

correctness of the mitre. Another board, termed a shooting-block, is required, and this is made as in Fig. 3. A piece of deal 2 feet long, and $1\frac{1}{2}$ feet wide, and 1 inch thick, forms the base of the block A, and on this is screwed another piece of deal of the same length, but only 8 or 10 inches wide, and $\frac{3}{4}$ inch thick as B, and on B is securely screwed another piece of hard wood 2 inches thick, and shaped as C. Great care

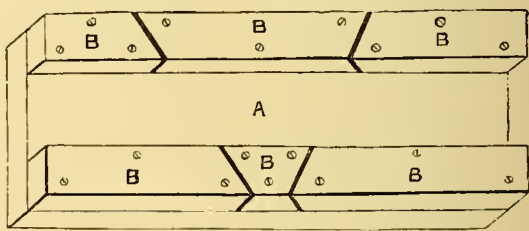


FIG. 2.—DOUBLE MITRE-BOARD OR BLOCK.

must be taken that the sides of C are at an angle of 45° with the sides of B. It is very important that the sides of C be at the correct angle, otherwise the mitres of the frame will not be correct, and consequently the joints will not fit closely together. The rest of the tools required must be purchased; they consist of a vice for holding the moulding when putting the frame together, and an iron block plane. The nails used for fixing the corners of the frame are what are

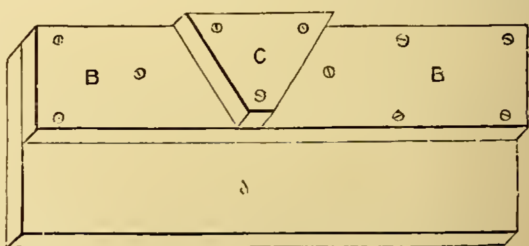


FIG. 3.—SHOOTING BLOCK.

technically termed "cut flooring brads," and can be obtained of various lengths from any hardware dealer. Churchill and Co., *Cross Street, Finsbury*, or any good carpenter's ironmonger, would be able to supply the plane and the vice, and I may add, that a parallel vice would be found the most serviceable.

Before commencing to cut the moulding for a frame, the size of the picture should be carefully marked on the inner, or "rebate" edge of the moulding, and the moulding then cut in the mitre-board. A tenon, or back saw, is generally used for cutting the moulding, as a coarse-set saw is apt to splinter off the composition from the face of the moulding. After cutting off the four pieces of moulding required for the sides and ends of the frame, the faces of the mitres require to be smoothed, and for this purpose the shooting-block is used. The corresponding sides and ends of the frame must be *exactly* of the same length, otherwise the frame will be a failure, and slight mistakes in the length may be rectified by means of the plane and shooting-block, and an iron plane is much better than the ordinary "trying," or "Jack" plane for this purpose. The back of the moulding should be placed against C, and held there firmly with the left hand, whilst with the right hand the plane should be worked; of course, the plane will be on its side on A. After the pieces of moulding have been carefully planed in the shooting-block, all that remains is to put the frame together; but before doing this, it is advisable to slightly scoop out the face of the mitre, being careful not to touch the edges, with a sharp hollow gouge. This gives more room for the glue, and admits of the joint being much closer together, thereby giving a neater appearance to the frame. One side of the frame is now placed in the vice, close to the mitre, and one end of the frame held firmly to the mitre, taking care that it is perfectly level; two or three holes are then made with a bradawl, the ends are slightly touched with thin glue, and then the mitres are nailed together with two or three brads. The number and size of the brads depends entirely upon the width and weight of the frame. The brads are punched down with an ordinary punch, and the holes are filled up with putty coloured with yellow ochre, so as to hide completely the appearance of nails having been used. Should, as is frequently the case, any of the composition with which the moulding is coated chip off, a little "bronze metal," which may be obtained of any colourman, is applied to hide the white appearance. I am of course writing of the ordinary gilt frames, but in the case of black frames, a little lamp black with the putty is used for the nail holes, and black varnish to cover any defects on the face of the moulding. In large heavy frames it is frequently the practice to use a plain gilded slip, and this slip is simply mitred and placed in the rabbet of the frame.

After the frame is put together, the next thing is to put in the glass; and I think it will be better for the amateur to get the glass cut to the required size by the glazier from whom he purchases it; of course, if preferred, the amateur can easily cut the glass himself to any size, all he requires for the purpose, being an ordinary glazier's diamond and a wooden T-square. Backboard, for placing on the back of the picture, to keep it in its place, can be obtained in lengths of 10 or 12 feet, from any picture-frame maker. It is very thin deal, and generally runs to about 8 inches in width. It can be cut to any size by using an ordinary knife, and cutting it in the same way as one would cut a piece of cardboard; this backboard is cut so as to fit closely in the back of the frame, and is kept in its place by the insertion of a few small brads—these brads being generally pushed into the side of the rabbet of the frame by a pair of pliers, or they can be knocked into the wood by using the sides of a chisel or a small hammer, care, however, being taken not to break the glass.

The only thing to be done now is to paste over the whole back of the frame a piece of stout brown paper, to keep the dust, etc., away from the glass and the picture, and to insert the rings for the cord. It will be found advisable to place the rings about one-third, or even half-way, from the top of the frame, so as to throw the top of the frame away from the wall, and thus give better effect to the picture.

In my next article, I intend giving full instructions as to the making of Oxford frames, these requiring far more skill in their manufacture than the ordinary frame.

I have said nothing respecting the selection of the various kinds of moulding used for picture frames, as this is a matter that depends entirely upon the individual taste of the amateur. I may, however, add that mouldings of every description can be purchased in lengths from all respectable picture-frame makers, and at nearly any price, from the cheapest quality at about one penny per foot, or even less, up to two or three shillings per foot.

WAYS AND MEANS.

[THE RECEIPTS brought together under this title are gathered from various sources. They are given here because they are each and all apparently possessed of value, and likely to be useful to the Amateur. It is manifestly impossible for the Editor to test them, or to have them tested, and he therefore disclaims all responsibility for their accuracy or otherwise. Amateurs who may try them are requested to communicate the results arrived at.]

PORTLAND CEMENTS.—The longer Portland cement is in setting, the better it will be. At the end of a year from the time of mixing and laying it, one part of cement to one part of sand is about three-quarters the strength of new cement. Strong cement is heavy, blue-grey in colour, and sets slowly. The less water used in mixing cement the better.

Safety Envelope.—A safety envelope may be made by treating that part of the paper covered by the flap with a solution of chromic acid, ammonia, sulphuric acid, sulphate of copper, and fine white paper. The flap itself is coated with a solution of isinglass in acetic acid, and when this is moistened and pressed down on the underpart of the envelope a solid cement is formed entirely insoluble in acids, alkalies, hot or cold water, steam, etc.

Uninflammable Tissues.—At a recent meeting the Société d'Encouragement de l'Industrie presented a prize of £40 to M. Abel Martin, for the processes he has invented for rendering tissues uninflammable. The different preparations used by M. Martin are as follows:—1. *For Light Tissues*—Pure sulphate of ammonia, 17 lbs.; pure carbonate of ammonia, 5 lbs.; boracic acid, 6 lbs.; pure borax, 4 lbs.; starch, 4 lbs.; water, 220 lbs. When the solution is at a temperature of 30° C., the tissues are dipped in it, then taken out, and dried and ironed, as if they had been starched in the ordinary manner. The liquid costs about a penny per pint. 2. *For Printed Calico, Theatrical Scenery, etc.*—Hydrochlorate of ammonia, 33 lbs.; boracic acid, 11 lbs.; glue size, 6 lbs.; gelatine, 2½ lbs.; ordinary water, 220 lbs.; limestone, *quant. suf.* The mixture is heated to 80° or 90° C., until it has an oily consistency. It is put on to the material with a brush, like varnish. In the case of scenery the liquid is put on the wrong side of the canvas, care being taken to lay it on the frame-work and mountings. With about 2¼ lbs., costing twopence, nearly five square yards can be coated. 3. *For thick Cloths, Cords, Straw, etc.*—Hydrochlorate of ammonia, 33 lbs.; boracic acid, 35 lbs.; borax, 6 lbs.; water, 220 lbs. The combustible materials are dipped into the mixture at a temperature of 100° C. for fifteen or twenty minutes. This liquid costs about twopence halfpenny per pint. 4. *For all sorts of Paper*—Sulphate of ammonia, 17 lbs.; boracic acid, 6 lbs.; borax, 4 lbs.; ordinary water, 220 lbs. This mixture is heated to 50° C., and costs about a penny a pint. It is stated that M. Martin's processes preserve their efficacy even after the fabrics have been exposed for several months in a high temperature, in dry and humid air. Some white and coloured tarlatans, cotton checks, cloths, printed paper, and a cradle were placed in a stove at 35° to 37° C., and left there for eight months, and remained uninflammable, the colours not changing. The first coverlet of the cradle, the curtains, etc., were also uninflammable. The wood was carbonized superficially, but would not burn.

Preservation of Wood Posts.—It is stated in the *Farmers' Gazette*, that by taking a simple precaution which costs neither money nor labour, the durability of posts put in the ground may be increased by 50 per cent. This is simply by taking care that the wood is inverted, that is to say, placed in the ground in the opposite direction to that in which it grew. Experiments have proved that oak posts put in the ground in the same position in which they grew, top upwards, were rotten in twelve years, while others, cut from the same tree and placed top downwards in the soil, showed no sign of decay for several years afterwards.

German Wood Filling.—Fill the pores of the wood with new tallow and plaster of Paris, well amalgamated before a fire, if the weather is cold. Darken, if required, with any colouring to suit. When well rubbed in, give a coat of shellac, and French polish or varnish.

Lard as a Preservative of Eggs.—Lard is a more simple and far less disagreeable unguent for preserving eggs than paraffin, and quite as effectual. The method to be adopted is as follows:—Have any old box or packing-case to hold bran or sawdust, in which the eggs may be packed. Collect the eggs early in the morning, while *quite fresh*, and *as they are taken from the nest, be careful to keep them with the small end downwards, and not to shake them.* To prevent this, let the collecting-basket contain chaff, bran, or sawdust, in which they will stand upright. As soon as the eggs are collected, put them at once into the store-box, in which a layer, about two inches deep, of the chaff, bran, or sawdust has been already placed. Holding each egg upright—a position which must be scrupulously observed in all cases, whether in the collecting-basket or box, or while being greased—rub a little lard over the egg with a scrap of linen, till not a portion of the shell remains ungreased, then stand it upright in the chaff. Place the eggs an inch apart, till the first layer is completed, cover them well, and repeat the process on the top. A teaspoonful of lard will preserve two or three dozen eggs; and if it is kept in a saucer, with the scrap of linen, it will be always ready. Do the same with the evening's eggs, as the fresher they are the better. If there is room, and a little expense can be afforded, a board like a long shelf, with holes cut in it in which the eggs will stand upright, will be better than the chaff, for these reasons: it can be placed out of reach of rats (should there be any), and the date can be marked in pencil against each egg, and the eggs can be used in turn. This mode of preserving eggs, it is said, never fails.

Construction of Frame Houses.—A method of rendering an ordinary frame house dry, warm, and cool, is thus described by a daily paper: These conditions are obtained by the introduction of a mortar or concrete wall between the upright timbers or "studding" of the ordinary balloon frame. The wall

is very cheaply made, the mortar being simply filled in between boards loosely nailed on, and as soon as the first or lower filling has set, the boards are taken off and nailed on higher up, and the space again filled. In this way, the filling process and removal of the boards being repeated as often as necessary, the wall may be carried up as high as desired, whether to the roof, or only to the top of the first story, but the full height of the studding is best. The plaster may be put directly upon the interior surface of this wall, which, of course, will be of the same thickness as the width of the studding timbers, usually 4 inches, and will be flush with them on both sides. But to prevent the dampness which a solid wall without an interior air space would be sure to produce, strips of lath must be nailed up and down on the studding on the outside of the house, and the siding nailed to and through these strips. There will now remain, when the siding is put on, a space of about a third of an inch between the siding and the wall. This is not sufficient for a harbour for rats or mice, while it is quite enough to insure the retention of its warmth by the wall during a winter night, at least in a sufficient degree to prevent frost. On the other hand, the heated condition of the outer surface of the siding in summer will not be readily transmitted through the non-conducting material of the wall, which will, therefore, maintain nearly the same temperature day and night at all seasons of the year.

A Plastic Metal.—A very useful metal has been brought out, which, under the name of "Richards' Plastic Metal," is being made by the Richards' Plastic Metal Company, *Charlotte Street*, *Birmingham*. In general outward appearance it resembles some of the other varieties of white metal so largely used for lining bearings, but it has a remarkably close, hard texture and takes a good polish. Its special feature, however, is its great affinity for other metals, this affinity enabling it to be readily "pasted on" with a plumber's soldering iron, it being impossible when it is thus attached to remove it by abrasive force. As it fuses at about 450° Fahr., it can be readily melted in an iron ladle over an ordinary fire, while it is stated that it contains neither lead nor spelter, and that it is not deteriorated by re-melting. The ease with which it can be applied renders this metal peculiarly applicable for effecting repairs in the colonies, etc., where casting furnaces are not available.

Polish for Walnut Wood.—Mix with two parts of good alcoholic shellac varnish, one part of boiled linseed oil; shake well, and apply with a pad formed of woollen cloth. Rub the furniture briskly with the mixture till the polish appears.

Strong Mucilage.—The following cement is recommended to those who require a mucilage possessed of sufficient tenacity to fasten sheets of pasteboard together:—Melt together equal parts of pitch and gutta-percha. To nine parts of this composition add three parts of boiled oil and one-fifth part of litharge. Continue the application of heat, and keep stirring until a thorough union of the ingredients is effected. Apply the mixture hot, or somewhat cooled and thinned with a small quantity of benzole or turpentine oil.

How to Loosen a Screw Rusted In.—In order to do this, apply a blow-pipe to the head of the screw, and it will presently yield to the pressure of the screw-driver. This is most effective in all obstinate cases.

Nitrite of Amyl.—A few drops of nitrite of amyl, it is said, have a powerful influence in restoring the functions of the heart in cases of drowning, hanging, or fainting. It is suggested, therefore, that it should always be used whenever attempts are being made to restore to life an individual apparently dead, or when it is desirable to settle the question whether a person is really dead or not. In ascertaining death the nitrite of amyl might be used along with the test of tying a cord round the finger. If the circulation has entirely stopped, the part beyond the cord never becomes any thicker; but, if the circulation continues, however slowly, the finger-tip beyond the ligature will sooner or later begin to swell.

To Prevent Glue from Cracking.—Glue frequently cracks because of the dryness of the air in rooms warmed by stoves. An Austrian paper recommends the addition of a little chloride of calcium to glue to prevent this.

Bottle Wax Insoluble in Alcohol.—Soften glue in cold water, and melt it in the water bath to form a very thick paste; to this add good glycerine in quantity equal to the dry glue taken, and continue the heating to expel as much of the water as possible. It may be cast on a marble slab to cool, and melted for use as required.

BRASS CASTING AT HOME.

By F. J. Durrance.

I.—HOW PATTERNS AND MOULDS ARE MADE.

I AM an amateur mechanic, and for several years have been engaged in making all kinds of scientific apparatus, mechanical models, etc. During that time I have often required small brass castings; and as I have experienced great difficulty in obtaining them quickly, besides the great cost of small work, I

determined on trying to cast them myself. After numerous experiments and failures, the result I now obtain is perfect success. I can cast almost anything up to two pounds' weight with the greatest ease, and for the information and, I trust, benefit of my brother amateurs, I will describe the method that I now invariably use. The materials required cost but a mere trifle (a great thing for poor amateurs), and if the readers of AMATEUR WORK will carefully follow the instructions, they cannot fail to succeed. And I may say, before entering on the practical part of my subject, that I am inclined to think that the majority of amateurs will find, as I do, that a little knowledge of this kind is extremely useful, and will greatly aid them both in carrying out any special kind of work in which fittings of the kind I am about to describe may be required, and in executing repairs. And more than this, if a man be possessed even of moderate skill as a carver and pattern-maker, it will render him important assistance in casting brass fittings for cabinet work for himself and his friend, for fittings of this kind, in strict keeping with the character of the work, are at all times not obtained without much trouble.

The last articles which I cast were four guides for the sliding bar of a fret-work machine, see Fig. 1, where A and B are the guides. As they were all alike, instead of making them separately, I cast them in one long piece, and then sawed them off a little wider than wanted, to allow for filing up to size. The bar was made from $\frac{1}{4}$ inch steel. The first thing to consider was the pattern, and as they are mostly made in the same manner, the following description will do for all flat work (lathe-turned work will be dealt with afterwards).

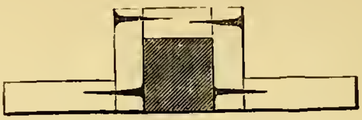


FIG. 2. SECTIONAL SKETCH OF PATTERN FOR GUIDE, MADE IN WOOD.

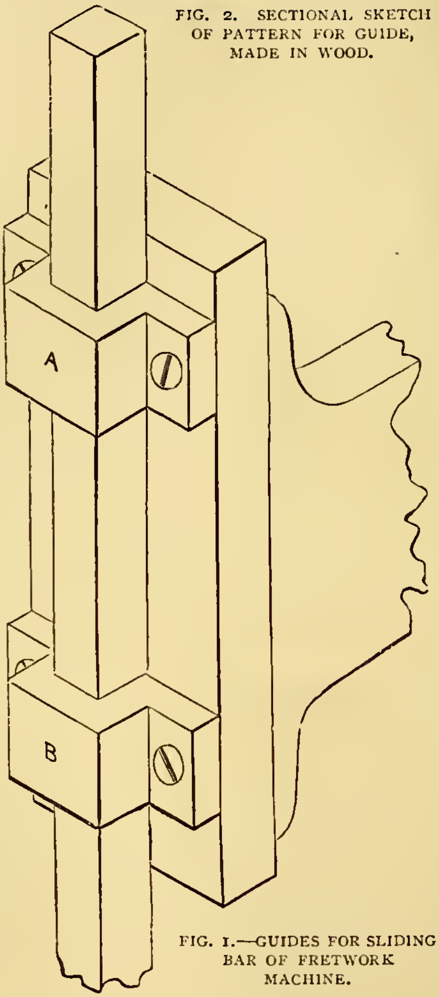


FIG. 1.—GUIDES FOR SLIDING BAR OF FRETWORK MACHINE.

I took a clean cigar-box lid, cut off $4\frac{1}{2}$ inches, divided it into four slips, joined them together with glue and pins (see sectional sketch, Fig. 2), making the pattern fit tightly over the bar, the dark shaded portion showing bar in position, the pattern is now to be buried in plaster of Paris; but before proceeding further, I will now describe one of my most serious difficulties. I found the wet plaster swelled the wood pattern, splitting the plaster mould in every direction (by expansion). If that did not occur, the mould stuck so to the pattern, that I had to split it out bit by bit, spoiling it, of course, which was rather awkward when you require several similar castings. I eventually overcame this serious difficulty in a very simple manner, which I will now explain. Into an old tin or jam pot put a small piece of resin as large as a thimble, and place it in the oven to melt; when melted, add a piece of beeswax the size of a walnut; when both are melted, stir up well, now warm the pattern very slightly before the fire, dip a brush into the solution (a penny gum-

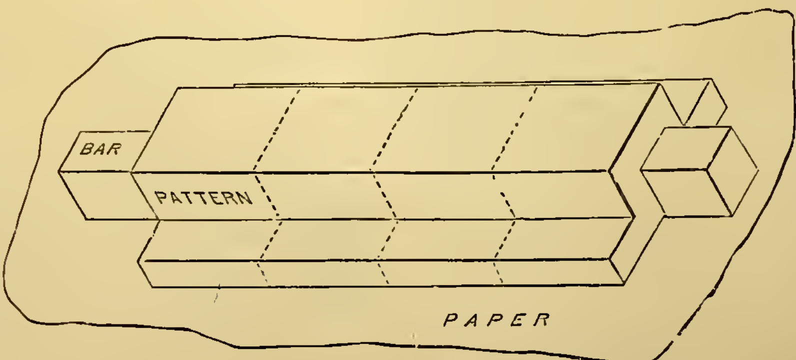


FIG. 3.—DIAGRAM SHOWING METHOD OF MAKING MOULD.

brush is just the thing), place the bar in position (which afterwards forms the core), then paint all over with the solution. If the first coating soaks in, when cold, give it another one; when finished, there should be a very thin film of wax over all. Our pattern is now waterproof, and not only that, the mould on being slightly warmed, the wax coating softens, and the pattern now comes out as easily as taking off an old glove. The pattern is now ready.

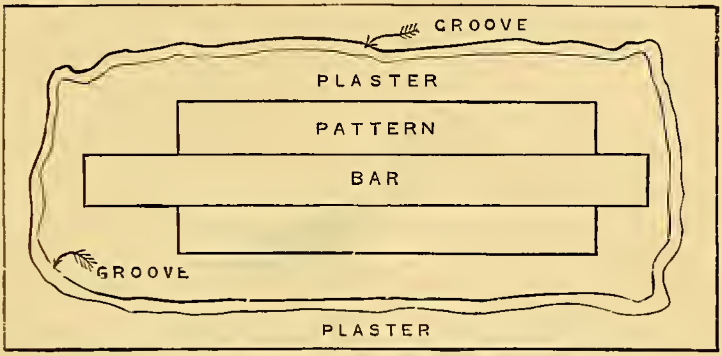


FIG. 4.—REVERSED VIEW OF MOULD WHEN PAPER IS REMOVED.

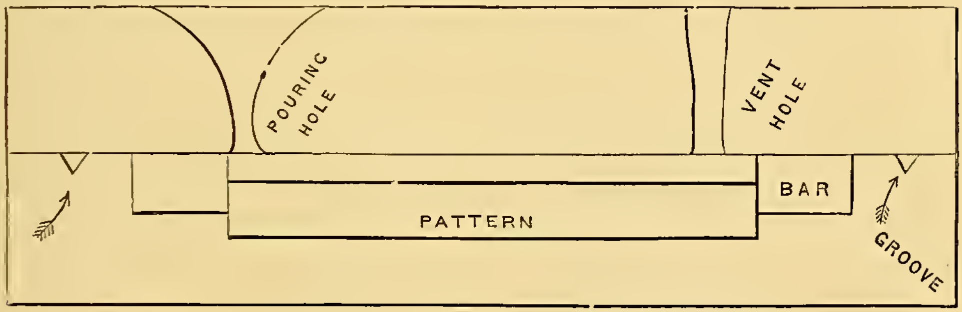


FIG. 5.—LONGITUDINAL SECTION OF MOULD WHEN COMPLETED.

Next comes the mould. I found that plaster alone was not fit for the purpose, it would not stand the intense heat without cracking in every direction, spilling out the brass, and spoiling the mould. After trying dozens of different ingredients, I found that ordinary gas coke was perfection; it must be smashed up fine with a hammer, and sifted through a sieve or piece of gauze, or coarse muslin. Ordinary clean cinders which drop out of the fire will do, but there must be no unburnt coal in them. Now place the steel bar into the pattern, to act as a core when the metal is poured in, let it project equally on each side, slightly grease over all with a piece of cotton wool or camel-hair brush slightly moistened with oil. Lay a piece of smooth paper on the corner of the table, or on the flat lid of a box, then place the pattern face down on the paper, as Fig. 3, the dotted lines showing how it is afterwards divided. Now put pieces of wood or cardboard round the lot, standing about an inch higher than pattern, and allowing the same all round; or, better still, get a cardboard box from the drapers, and simply lay it in the bottom.

Now for the most important part, *i.e.*, mixing the plaster. Firstly, always mix enough; plaster is very cheap. Into a basin put half a cupful of crushed coke, cover over with water about an inch, now sprinkle in the plaster with left hand, stirring all the time with the right, with a large spoon, just as if mixing batter or porridge, until the mass is as thick as cream, beware of making too thick; if you do, add more water. Having well mixed, hold the pattern firmly down with a piece of wire, a hair-pin, for instance, and put a spoonful of plaster right on the top and middle of pat-

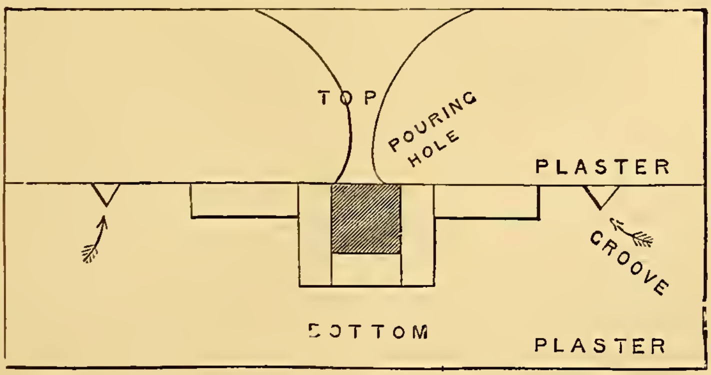


FIG. 6.—TRANSVERSE SECTION OF MOULD WHEN COMPLETED.

tern ; now hammer smartly on the table with your fist, alternately spooning in the plaster and knocking, you will see it falling into every crevice. When all is well covered, pour in the lot until it fills the box, then put by for an hour to dry, then turn it face or paper side upwards. Pull off paper, and if any plaster has run under, scrape it level with a table-knife. The mould will now have the appearance of Fig. 4. Now, with a pen-knife, or, better still, a V or half round gouge, make an irregular groove all round, as per sketch, the purpose of which is double. Firstly, when the top is cast on and taken off, it will always go back into the same place (very important when an irregular figure is cast in two parts) ; and, secondly, it forms a sort of trap to prevent the escape of the hot metal.

Now for top part of mould. Wrap tightly round the bottom half a broad thick piece of paper, letting it stand about an inch above surface, fasten securely with wax, now get an old lather or paste brush, wet it, rub on a piece of soap, then lather thoroughly all the surface of plaster ; this will effectually prevent the two halves sticking together. Now mix plaster, and proceed exactly as before ; do not forget the knocking, as it drives the air imprisoned in the plaster, which makes it full of holes. Fill up to top of paper, put away to dry for two hours, pull off paper, scrape until you see line of division plainly, then gently tapping with wood, the two parts will separate easily. Drive a nail or screw into each end of pattern, tie a piece of string across. Now warm the mould from the back until the wax softens, pull gently, and out comes the pattern. Make two holes, one for pouring, and one to permit air confined in mould to escape (see longitudinal and transverse sections, Figs. 5 and 6, showing mould previous to taking out pattern and core). Now place the bar back in its place, thoroughly smoke all the inside by a bit of tarred string or anything giving off a great smoke, put together, tie with *iron wire*. When made hot, we are now ready for pouring in the metal, which will be dealt with in the next article.

(*To be continued.*)

BRAZING AND SOLDERING.

By GEORGE EDWINSON.

II.—SOLDERING TIN, ZINC, AND COMPOSITE METAL.

THE tin plates of which many culinary utensils are made are not composed of solid tin, but are very thin plates of sheet-iron coated with tin. Tin is a very soft white metal resembling silver, and melts at a temperature of 442° Fahr.; but iron does not melt at a temperature of 2000° Fahr. The well-known tendency of iron to rust when exposed to wet or the action of damp air, renders it unfit for culinary utensils where lightness and strength is required ; but by coating the iron plates with tin in a bath of molten tin, they are protected from rust as long as the coat of tin remains perfect, because this metal is not oxydized by water or by moist air. But this coat of tin is liable to destruction from two causes, the first from over-heating the vessel, the second from oxidization of the iron beneath; this last is due to minute flaws or fractures in the coat of tin, the rust commencing at those parts and spreading beneath the tin ; destruction from the first cause can never happen if the utensil is kept filled with water. When, however, some parts of the utensil, such as the handle of a saucepan or a kettle, are exposed to the flame of a fierce fire, neither the water in it nor the vapour of the water will suffice to keep the tin below melting point, and in this way not only does the part become unsoldered, but the coat of tin also suffers and the work of destruction commences. Even in this case the tin, but not the iron, is melted, and therefore articles made of tin plate may be safely soldered with a solder that melts only a little below the melting point of tin. Six parts of tin to one part of lead makes a solder that melts at 383° Fahr., whilst another made of four parts tin to seven parts of lead, melts at 430° Fahr., but I have not tried the merits of those solders, although I think they may be useful to some who require a solder to stand more heat than the tinman's fine solder mentioned in my last. The utility of all solders, hard or soft, depends upon their property of not only melting at a lower temperature than that required to melt the metal of which the article to be soldered is made, but also to combine with the surface or edges of the metal to form an alloy therewith ; this they do by yielding a part of their heat to fuse the soldered metal. Hence soldered joints are strongest when put together with a solder that will run at a temperature a few degrees below the melting point of the metal to be soldered.

Tinning the Iron.—This is a job that must be attended to before we can venture to solder any article, for the copper soldering tool, made according to foregoing directions, is useless until it has been properly perpared by tinning it. To do this, heat the copper to a very dull red, quickly rub a file over the four facets of the point to brighten them, merely moisten them with the chloride of zinc or killed spirits, rest the end of a stick of solder on a brick or piece of sandstone, and press the hot copper on it. A drop of solder will melt off on the brick, rub the facets briskly on the brick in the melted solder for a few moments, then wipe them with a piece of rag or the duster, when they will be seen to be covered with a bright film of tin. Another way is, to heat up the iron as before,

and rub it in a cavity previously worn in a brick, together with some powdered resin and a drop of melted solder. Still another method is it rub the heated iron on a lump of hartshorn (sal-ammoniac) together with a drop of solder. The copper bit must always be kept thus tinned, and if it loses its coat the tinning must be renewed by one of those processes, for an untinned iron will never draw solder. To prevent the tin from being burnt off, the iron must never be heated above a dull red heat, this will be quite hot enough to melt solder, if it is heated to a perceptible red, all the tin will be burned off; practical solderers learn to determine the safe heat by taking the iron from the fire occasionally, and holding it within two inches of their face. Smiths do not favour amateur nor professional tinkers' irons in their fire, because the solder is apt to foul a clean fire, but the iron can be heated in any fire; travelling tinkers use a kind of iron pail with holes punched in the side (see Fig. 12) as a furnace. The iron may also be heated by gas in a little contrivance invented by Mr. Fletcher, *of Warrington*, and sold by him for 2s.6d. and 3s.6d. (See Figs. 13 and 14). Irons are also sold made similar to Fig. 9 in my last, but with the gas tube extended through the handle; this is put on over the gas burner, and the gas is lit at a number of small holes just under the head of the iron, it therefore acts as a Bunsen burner and the circling rose of flame heats the copper. A soldering iron to be heated by a strong current of electricity was also introduced to the notice of the British public a few years since, but it has not come into general use, nor is it likely to receive such favour.

Soldering Tin.—In soldering a joint of new metal, it is rarely necessary to scrape the tin or rub it with emery cloth; but, if the new tin has been soiled, the faulty spots must be cleaned before they are soldered. It will be well to practise using the soldering-iron by soldering two small sheets of tin together. Lap them $\frac{1}{8}$ inch over each other, rest them firmly on a bench, touch a spot at each end and in the middle with the "killed spirits," and melt a drop of solder at each of those points to hold the sheets together; now moisten the whole joint with the spirits, press the hot soldering-iron on the top part of the seam, and hold it there until the drop of solder melts. Then firmly and slowly draw the iron downwards along the joint, and the solder will be seen to follow the iron, and leave a thin trail of it along the joint. If there is not enough solder in the first drop to lead on to the next, press the stick of solder to the iron, and melt off another little drop, but be careful not to have too much solder, for the botchers' joint is known by the lumps and splashes of solder sticking to it, whilst the secret of a neat, firm joint lies in having iron just hot enough to freely melt the solder, and just enough of this to flow into the joint and leave the thinnest trail visible on the outside.

Many persons prefer powdered resin along the joint as a flux instead of "killed spirits," and I would advise the amateur to use resin in soldering tin, if he can make a neat joint therewith, as there are several points in favour of its use, the principal of which is that it does not cool the soldering-iron. Sal-ammoniac, or muriate of ammonia, crushed to powder and made into a paste with water, is also used as a flux.

To stop a hole in the bottom of a tin saucepan, first rinse out the vessel with some hot water in which some washing soda has been dissolved, then scrape all soot and dirt from the part immediately surrounding the hole, and, if this is a small one, apply a little flux (spirits of salts) to the hole, and follow it with a drop of solder held on the soldering-iron. If the hole is too large to be thus stopped, a patch of new tin must be put on, and to do this it will first be necessary to scrape a clean spot around the hole as large as the intended patch. If there are several small holes in a group, cut the patch to cover all of them, then apply the flux as before, and melt a thin layer of solder on the clean spot to be covered by the tin patch; see that this fits level, apply a little flux to the under part of it, place it in position, rest the hot soldering-iron upon it and as soon as you feel the patch float on the melted solder, gently press it down in its place, and let it cool.

To solder on a handle, or any other part accidentally melted off, first scrape or file off all the old solder, and make the foot or feet of the handle fit closely around the edges. Then melt a thin layer of solder on the parts to which the edges are to be united. Hold on the handle in its place with the left hand, press the hot iron on the upper right side of the foot, and dexterously bring it around to the left side, drawing a thin stream of solder after it. Handles on covers look best when sweated on, a process similar to that of putting a patch of tin on the bottom of a saucepan. Always work from left to right, and from the top down a slight incline, wherever possible.

When the bottom of a saucepan is very much burnt or worn, it will pay best to cut the bottom piece off, and solder a new bottom on, rather than waste time and material in putting on several patches. But for this work we shall require more tools, viz., a compass or dividers to mark out a circular piece of tin; a pair of stout shears to cut it out; a smooth-faced hammer and a tinman's "stake," or a substitute for it; a pair of pliers; and a "hack-saw," or notched knife. The tin must be cut with a diameter $\frac{1}{2}$ inch largei than that o the bottom of the saucepan, to allow $\frac{1}{4}$ inch to be turned up all around. Strike out the larger diameter with the compasses, then the smaller one $\frac{1}{4}$ inch within the other. Cut out to the first line, notch the rim in a few

places with the shears, and turn it up to the second line all around by the aid of hammer and pliers, and thus form a shallow saucer.

Now cut off the bottom. First cut through with the hack-saw, complete the work with the shears. Then hammer the cylinder to fit in the shallow saucer fairly all around, and solder it in its place. Do not be discouraged if you do not at first succeed in making a neat job, for it is not an easy one.

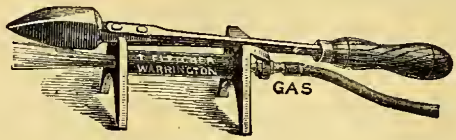


FIG. 13.—FLETCHER'S NEW SOLDERING-IRON. One-eighth full size.

Soldering Zinc. — Zinc is a bluish-white metal, a little lighter than pure tin, but not fusible at such a low temperature as the latter metal. The melting point of zinc is 773° Fahr.; we may therefore safely use the tinman's best soft solder in soldering articles made of zinc; but the iron must not be too hot, nor must it be allowed to rest on the metal. We rarely meet with articles made of pure sheet tin; but, on the contrary, articles made of sheet zinc are very common, and there are but few dwellings where this form of the metal is not used in the construction of rain-gutters, pipes, and channels on the roof; hence, sheet zinc is sold under the name of "roofing-zinc."

The rough blocks, ingots, grains, and other forms of unmanufactured zinc are often sold under the name of "spelter;" but as this name has been appropriated by jewellers as a trade term to designate a certain quality of soft brass, it is not always safe to assume that zinc is meant when "spelter" is named as an ingredient in any alloy. Such a prostitution of terms frequently leads to confusion.

FIG. 12.—PAIL-FURNACE FOR HEATING SOLDERING-IRON.

When zinc is unprotected by a varnish or paint, it may easily be recognized by its tint and weight; but there are now many articles made of zinc, and afterwards bronzed, brassed, coppered, plated, and even gilt. The zinc character of those may be detected by scraping away the coating in an obscure part, and touching this with a drop of hydrochloric acid. If the acid fizzes up quick, and leaves a grey patch, the metal may be pronounced to be zinc; for iron, pewter, Brittania metal, and similar alloys are not so readily affected by this acid.

When zinc replaces tin as a coating for iron, as it does for wire and for heavy plates, the metal thus coated is known under the name of "galvanized iron." Although zinc melts at a higher temperature than tin, it will be well to know that it becomes very brittle, and may be ground to powder. If heated to 400° Fahr., or below the melting-point of tin, it may therefore not be raised to this temperature when soldering it; but when only heated to 250° Fahr., or not over 300° Fahr., it may be bent, rolled, or hammered without any danger of breaking.

The proper flux for soldering zinc is hydrochloric acid diluted with one third its bulk of rain-water, and the same for articles made of galvanized iron. "Killed spirits" is unreliable, and resin unsuitable for this purpose.

Soldering Compo.—The name "compo" has been given to an alloy of tin with lead and zinc, now largely used in the manufacture of small gas-pipes. Those pipes were formerly made of pure tin, but pure tin pipes are rarely to be met with now, and, as most new compo pipes contain zinc, care must be taken not to get this metal among the tin used in making soft solder. The more fusible solders are best to use in soldering this composition, and they should be cast in very thin strips. If the soldering-iron is used, it must not be too hot, but it is usual to use the blow-pipe in making joints in "compo" pipes, and directions for doing this will be found in the articles on "Practical Gas-fitting."

Resin is the most approved flux for this work, and here the candle end will come in handy to be used as "touch," to keep the solder from straying and clinging to the metal, and also to clear the joint.

Soldering Pewter.—Best pewter should be made of tin, antimony, and copper; but common pewter is innocent of copper, and the commonest contains lead instead of antimony. As its fusibility varies with its composition, only the most fusible solders may be safely used, with finely powdered resin as a flux. Britannia metal and Queen's metal may be said to be varieties of pewter; they are quite as variable in their composition, and therefore require a corresponding caution in selection of solders, and treatment whilst being soldered.

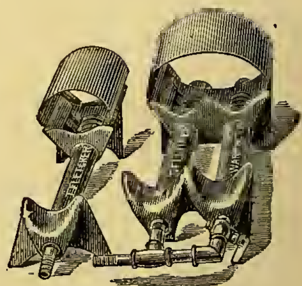


FIG. 14.—OTHER FORMS OF SOLDERING-IRON HEATERS (FLETCHER).

Suitable solders for lead will be mentioned in a future article on the subject.

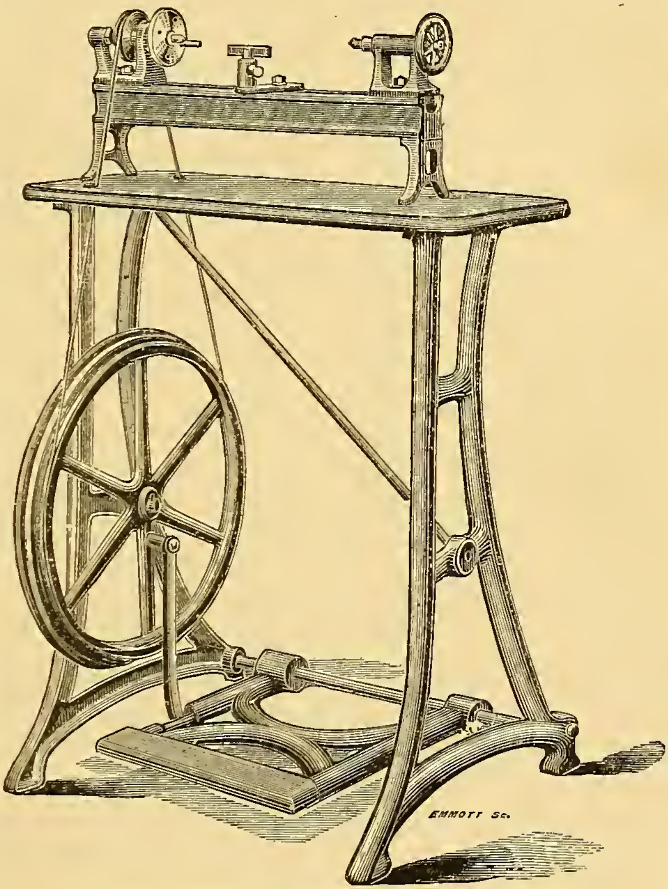
(*To be continued.*)

NOTES ON NOVELTIES.

WITH three amateur wood-workers out of four, perhaps, the height of their ambition is to possess a lathe, and thus to bring it within their power to produce those ornamental accessories to carpenters' and joiners' work which it is impossible to turn out in proper style otherwise than by means of a lathe. And probably it is in much the same proportion, namely, as three to four, that the capacity of the pocket forbids the acquisition of the coveted piece of machinery; for good lathes, as a rule, are costly articles, and, when fitted with every appliance that the ingenuity of man has contrived for lathe-working, will run to an amount of money that none but the longest of purses can yield.

To the amateur's workshop, indeed, a lathe is a most necessary—nay, even indispensable—adjunct, and of late years much has been done to render its acquisition possible. It has, however, been reserved for the *Britannia Company, Colchester*, to produce a lathe that shall be both strong and cheap, and, more than this, of a sufficient size to permit of more than the manufacture of spindles and pillarettes, as they may be called, that are so extensively used in the ornamentation of brackets, sideboards, canterburys, and other pieces of furniture that are now so much in demand. At present no distinctive name appears to have been allotted to this useful appliance, which is illustrated in Fig. 1, and which, for lack of a better title, I have called, "A Cheap, Strong, and Useful Lathe for Amateurs," with the promise of announcing the name under which it is to be known to the trade as soon as the Britannia Company shall have named it.

The cost of the lathe as it stands is £2 15s., which we all must allow is a very low price for an article of this kind that is capable of doing genuine work, or, rather, by aid of which genuine work may be done. Its appearance may be gathered from the accompanying illustration, which gives a far better idea of it than any description of mine can do. The first thing that strikes the beholder on examining the drawing is its manifest solidity and stability. Its base is broad and firm, being thrown beyond the axis of the lathe both in front and behind to a considerable distance by the curved form of the legs which support the table, that, in its turn, sustains the bed of the lathe. The legs are flanged, by means of which strength is attained without the importation of great weight, and they are connected at the bottom, and at two places between the top and bottom, by transverse bars, of which the lower ones are utilized, on the right for the support of a diagonal stay, extending thence in an upward direction to the left until it meets the left hand side of the bed of the table to which it is secured, and on the left to carry the axis of the fly-wheel, by which rapidity of revolution is insured and maintained. The fly-wheel is set in motion by an excentric crank attached to a strong treadle, which works on a strong iron bar, extending from one side support to the other at the bottom of the machine towards the back. The fly-wheel is 20 in. in diameter, and is grooved for two speeds. The cord by which the lathe is kept in revolution passes through two holes pierced for its reception in the table. The table on which the lathe-bed stands offers a most useful place of deposit for chisels, gouges, callipers, etc., used by the turner when at work. The bed itself is of planed iron, and is 20 in. long. It is fitted with $2\frac{1}{2}$ in. steel centres, which can easily be blocked up to 4 in. for wood turning, and, as the engraving shows, it is fitted with a hand-rest which carries two T-irons of different sizes. In addition to these, it can be fitted with a circular saw for wood, with an adjustable platform, or a small saw-clinch, and it can also be furnished with emery and buff wheels for polishing, such as a jeweller uses. The objection commonly urged against cheap lathes is the double want of capacity and strength, most of them being more like toys than machines adapted for good



A CHEAP, STRONG, AND USEFUL LATHE FOR AMATEURS.
A New Speciality of the Britannia Company, Colchester.

service. Such, however, is far from being the case with this lathe, which is not "blown together," but will bear any amount of rough handling.

From Mr. A. Fischer, 11, *Saint Bride Street, E.C.*, I have received Part 1 of the "Pattern Book for Art Metal Workers." This beautifully-illustrated work, which is 14 in. by 10½ in., a size which gives ample scope for the production of drawings on a large and clear scale, will be completed in fifteen parts at 1s. each, the parts each containing eight plates, and being published at intervals of a fortnight. Of course, no amateur could ever hope to emulate or imitate the magnificent specimens of metal work of all kinds, by continental artists of all ages that are figured in this work; but the possession and frequent inspection of the plates will soon bring him to a knowledge of what good and artistic work in bronze, brass, and iron really is, and, if he have a taste that way, and can carve his moulds in wood or model them in clay, will afford him many a hint for carrying out ornamental castings for the adornment of home-made furniture. Any art amateur will recognize this when he examines Plate 1, which contains a balustrade and door and window mountings, executed by Ed. Puls, of Berlin, after designs by himself and the architects Gropius, Zaer, Heyden, and Meyerheim; and Plate 4, exhibiting the most elegant and elaborate patterns for keys by Otto Girard, of Berlin. Again, the iron mountings and rosette from the church at Gelnhausen on the Kinzig, of the fifteenth century, cannot fail to be suggestive for cabinet fittings in sheet brass or brass castings; and Plate 10, illustrating a lock in the Bavarian National Museum, Munich, for the wood-carver, as being easily adapted as a suitable subject for a panel.

Messrs. Harger Brothers send me some of their newest and latest designs for fretwork. Among these I specially recommend to the notice of fret-sawyers the hand-screens, Nos. 103 and 104, which, if cut in white holly or horse-chestnut, and placed against a backing of dark velvet, would present a most effective appearance. Among other designs that may be singled out for notice are No. 136, a double carte-de-visite frame, in which the conventional treatment of the Indian pink is admirably managed. No. 131, a window blind, exhibiting the flowers and foliage of the thistle, and No. 128, a Japanese cabinet in which the subjects for some of the panels are taken from Æsop's Fables. I must not omit the single symmetrical photo frame, No. 133, in which rabbits and ears of corn are cleverly combined.

The visit of the comet of this year, and the commotion in the scientific world about "sun-spottery," as one of the *Standard* leader writers has phrased it, have, I presume, combined to prompt Messrs. Crosby Lockwood & Co., *Stationers' Hall Court, Ludgate Hill*, to send me a copy of "Rudimentary Astronomy," by the late Rev. Robert Main, M.A., F.R.S., F.R.A.S., formerly Radcliffe Observer at Oxford, a work which has reached a third edition, and has been revised and corrected to the present time by William Thynne Lynn, B.A., F.R.A.S., formerly of the Royal Observatory, Greenwich. Inquirers into the science of astronomy will find in this book all the elementary information on the subject that they can need, as well as on spectrum analysis applied to the heavenly bodies. Not much is said with respect to astronomical instruments and their modes of use, for which the reader must be referred to Mr. Heather's "Surveying and Astronomical Instruments," forming No. 170 of Weale's Rudimentary Series, the work on astronomy being No. 86. The book contains 196 pages, and measures 7⅛ inches by 4¼ inches: its cost is 2s.

Mr. William Reeves, 185, *Fleet Street, E.C.*, sends me a little book which, in my opinion, cannot fail to prove useful to all who take an interest in the series of papers entitled "Organ Building for Amateurs," now appearing in AMATEUR WORK. Its size is 7 in. by 4½ in., the number of pages contained in it is 48, and its price is 1s. The author is Mr. J. W. Hinton, M.A., Mus. Doc., Trinity College, Dublin, and, being himself a practical musician, he may be regarded as a competent authority. The title of the book, which gives, as it professes to do, "facts about organs," runs thus: "Guide to the Purchase of an Organ; How to Order or Select One. What will it Cost? Intended for the use of the Clergy, Organ Committees, and Amateur Organ Builders." Beginning with a clear, though brief, *resume* of the history of the organ, as far as it bears practically upon organ building, the author next proceeds to give an explanation of the principal stops used in organs, many of which have been brought under the reader's notice in the articles by Mr. Wicks, and this, by reason of the information contained therein, and forming as it does, a complete little dictionary of organ stops, is by no means the least useful part of the work. The next chapter is devoted to a consideration of the tests which should be applied to new organs as a guarantee of their soundness. These tests are such as ought to be applied by buyers to every part of the organ in turn, including the frame, bellows, wind-chest, keys, pedals, and pipes. The fourth chapter touches on a few simple repairs, and the fifth on tuning, with a few remarks on the valuation of organs. As an assistance to the amateur, specifications are given for four different sizes of chamber organs and the same number of church organs, and three appendices are supplied, the first of which deals mainly with a consideration of stop combinations and the effects that are most desirable in relation to them, while the second is devoted to remarks on the scales of the various stops and faults as well as processes in modern organ building, and the third to the shortcomings of English organ builders, and the superiority of Continental organ builders in designs for and execution and decoration of organ eases and organ fronts. An index, which cannot by any means be termed exhaustive, is given at the end of the book; and in the last page appears some useful advice to amateur organ builders, in which it is pointed out that the failure of most amateurs is due to beginning work without any pre-arranged plan for it, and that the author, who resides at Feckenham House, Guernsey, is ready to supply any information that may be required "at a fixed rate of charge."

I have various trade catalogues this month, and much regret that the space at my command precludes my making more than a mere passing mention of them. Among them are "The Photographers' Guide," being a numerical and alphabetical list of prices of apparatus, materials, and chemicals required in the practice of photography supplied at Messrs. J. F. Shew and Co.'s Photographic Stores, 88

and 89, *Newman Street*, *Oxford Street:* and the "Illustrated Catalogue" of new and second-hand photographic lenses, cameras, apparatus, etc., of Messrs. Hunter & Sands, opticians, 20, *Cranbourn Street*, *Leicester Square*, *London*, *W.C.*, who supply every description of photographic, scientific, and mathematical instruments. Amateurs will find these catalogues most useful as price lists and books of reference, and those who desire any information on stoves, cisterns, and ironwork and hardware of any kind will do well to provide themselves with the current number of Martineau & Smith's Hardware Trade Journal, an illustrated monthly for ironmongers, engineers, machinery and implement manufacturers, etc., published by Messrs. Houghton and Co., 12 and 13, *Scotland Passage*, *Birmingham*, and sold at 1s. per copy, or 5s. per annum, if subscribed for, post free.

I have received from Messrs. Letts, Son, and Co. (Limited), 35, *King William Street*, *London Bridge*, *E.C.*, a copy of their Christmas Annual for 1882, which bears the appropriate name of "Yule Tide." It consists of a collection of tales by well-known writers, illustrative of the seven ages of man, with several full-page engravings printed in colours, accompanied by a picture by A. Havers, also in colours, entitled, "A Christmas Errand," the whole costing only 1s. Now amateurs, as a rule, are fond of trying their hands at framing pictures, and those who are in want of a picture to frame cannot do better than provide themselves with a copy of "Yule Tide," and the picture that is presented with it. The drawing itself, irrespective of margin, measures 27 in. by 16½ in. The subject is a little girl with blue eyes and golden hair, prettily dressed in the fashion of the day, in a fur tippet and green pelisse bordered with fur, with her hands plunged into the warm interior of a feather muff, on her way from home to the village hard by on "a Christmas errand," as the name of the picture implies. The figure of the child hastening along the road between banks covered with snow, is very cleverly drawn; her attitude and look affording unmistakeable evidence of the temperature of the air around her The sky, perhaps, is a little too red; but the rest of the colouring is excellent, the greens and browns of the little girl's dress, and the rich tints of her complexion, contrasting agreeably with the wintry look of the landscape in which she is placed. The picture may be framed close, after the manner of oil paintings, in a gilt frame; but I should feel disposed myself to interpose a thick mount with a broadly bevelled gilt edge between the picture and the frame. The mount, too, might be cut in the form of a shallow Tudor arch at the top.

And now I come to a genuine novelty of the highest value, and one which will commend itself to amateurs generally, and especially to those who have a craving for a little stained glass to add to the beauty and picturesque appearance of the home. This is McCaw, Stevenson, and Orr's Patent "Glacier" Window Decoration, which is, as the manufacturers state it to be, the most perfect substitute for stained glass that has yet been offered to the public. The sole agents for this beautiful specialty for England and Scotland are Messrs. Perry and Co., Limited, *Holborn Viaduct*, *London*, from whom all information with regard to it can be obtained, and at whose establishment, which is well worth a visit, large windows and window screens treated with this decorative medium are open to inspection.

The chief merit in the Glacier Decoration, apart from its great beauty and utility, is the simplicity of the method by which it is applied. Anybody can do it, for no manipulative skill is required, no apparatus, no messing about with gums and varnishes, and no fear of failure, as with Diaphanie. A clean sponge, a little clean cold water, a soft cotton cloth or dabber, and a sharp-edged knife or keen pair of scissors for dividing the material when necessary are all that is required, and the window decorator may set to work as soon as he pleases, having, of course, provided himself with a suitable selection of the coloured sheets, of which there are numerous designs, from the simplest possible, suitable for ordinary positions, to the most elaborate, which would not disgrace the windows of any ecclesiastical structure.

Of the designs, however, I will speak presently, proceeding now to a description of the simple process by which they are attached to the glass. The sheets are translucent in character—that is to say, they admit of the passage of light, but do not allow external objects to be seen through them, being possessed of about the same opacity as ordinary tracing paper. The surface of the material is adhesive on both sides, and the designs are, therefore, reversible. To give the reader the best idea I can of it, I may liken it to the substance called gelatine, which, indeed, the material in some measure resembles, as far as translucency is concerned; but there the similarity ceases, for the basis of the Glacier Decoration is paper, which, by the process to which it is subjected, is brought up to the rich and brilliant condition which it possesses when it is ready for use. The surface of the glass to which the sheets are to be attached must first be thoroughly cleaned. It must then be moistened with the sponge dipped in water, care being taken not to leave too much moisture on the glass. The sheets are then applied to the glass, and dabbed gently with the soft cloth, in order to press every portion of it in immediate contact with the glass, and to expel any air bubbles that may have got under it. This is the whole of the manipulative work required, and surely nothing can be more simple or more easy!

In Figs. 2 to 14 are given specimens of various sheets. Of these sheets there are a great number, and it may be easily seen that by a judicious combination of centre-pieces, corner-pieces, borders, flat colours, and leads, an infinite number of designs calculated to cover any area of glass, of whatever size, may be readily made up. Figs. 2, 3, 4, and 5 are centre-pieces, or corner-pieces, or panels for small windows. For the convenience of my readers, the number which each figure bears in the price-list is attached. They are each 6 in. by 6 in., and are sold at 3s. 6d. per dozen. Figs. 6, 7, 8, and 9 are specimens of borderings, some simple, others more elaborate; these measure 10½ in. by 4½ in., and are sold at 5s. per dozen. Figs. 10 and 11 are mediæval leaded designs, intended for larger centre-pieces, or even for corners for large windows. These are 10½ in. by 10½ in., and are supplied at 24s. per dozen. Figs. 12 and 13 are leaded designs of the same character, representing the rose and the plum; these are centre-pieces, and look effective when carried up the length of a long window, such as a staircase win-

FIG. 10 (No. 16).

FIG. 2 (No. 505).

FIG. 11 (No. 15).

dow; they measure 14½ in. by 10½ in., and are sold at 36s. per dozen. Lastly, Fig. 14 is a mediæval group. forming what is called "The Choristers' Window." It measures 22½ in. by 10 in., and is sold at 48s. per dozen. It forms a fine centre-piece, and looks extremely well when surrounded with a suitable bordering that harmonizes with it in colouring. It is impossible to do more here than give a bare idea of these designs for centres, borders, and corners; but I must not omit to say that, in addition to these, are various ground glass designs in white, 5½ in. by 5½ in., sold at 2s. per dozen, and others of the same size in grey, blue, yellow, and transparency at 3s. per dozen. Flat colours of various single tints are supplied in sheets, 10½ in. by 4½ in., at 3s. per dozen; leaded glass in squares, diagonals, and diamonds, various sizes, at from 2s. to 6s. per dozen, and leads, narrow and broad, 8½ in. in length, at 6d. per box.

FIG. 6 (No. 522).

FIG. 14 (No. 2).

FIG. 8 (No. 525).

FIG. 3 (No. 502).

FIG. 4 (No. 501).

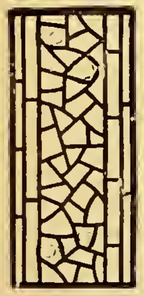


FIG. 7 (No 529).

FIG. 9 (No. 523).

Of course some of the designs have to be cut and fitted together in order to suit different areas, and so far as this part of the work is concerned, a little care in execution and an eye to harmony of colour and artistic effect will be required. Some of the designs do not require the addition of leads, others on the contrary do; the chief utility of the leads, however, is to conceal any defect in joining the pieces, and to give the effect of real stained glass windows in which the junction of the different pieces is effected by leads. It is desirable that all the heraldic colours should be supplied, so that persons may be enabled to carry out the adornment of windows with armorial bearings, and, if the manufacturers could give us these, and supply a material in which a little shading could be carried out, it would be a valuable addition to the original plan. Very effective coloured window screens can be made by means of glass enclosed in wood frames and adorned with the "Glacier" Decoration. When once affixed the paper adheres firmly to the glass, and cannot be removed without violence; and it is said that it can be cleaned without injury. I myself am inclined to think that in any case, especially in that of glass already fixed, it will be found better to apply the decoration to a fresh piece of glass, and to place this, the decorated side inward, against the fixed pane. The decoration will then be encased between glass, and the window may be cleaned without injury in the ordinary way. The loose decorated pane may be kept in place by a narrow beading attached to the sash-frame by needle points.

FIG. 12 (No. 11).

FIG. 5 (No. 504).

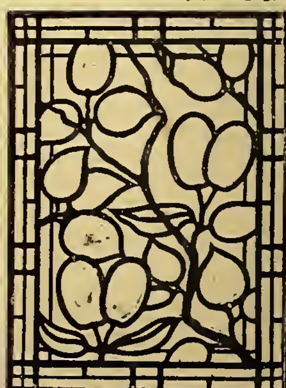


FIG. 13 (No. 13).

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

ERRATA.

The following printer's errors on page 480, 1st column, require correction:—

1. In reply to R. H., instead of "half a chain spring," read "a whole *chair* spring."

2. In reply to W. C., instead of "brass pallets," read "*bass* pallets;" and for "relief panels," read "relief *pallets*."

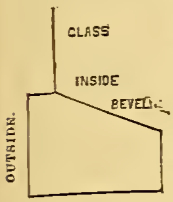
Gilding Picture-Frames.

Baimscombe.—A series of articles on gilding frames, and carrying out such work in gilding as may be within the compass of amateurs, will be given in the present volume.

G. M. H. (*Hampstead*).—Some articles on gilding are in hand, and the work of re-gilding worn frames will be treated in due course.

Building Greenhouses.

R. W. (*Kirkby Woodhouse*) writes:—I would offer a suggestion to the readers of Amateur Work upon the article, "A Small Greenhouse for Amateurs." The wall-plates of most greenhouses are left square at the top. This is a great inconvenience, and I believe a mistake, as the water which drains from the glass inside rests on the wood, and, whether painted or not, produces premature decay. This can be remedied by having the inside bevelled from the glass to about an inch or an inch and a half. The water then runs off the wood, which will thereby last years longer. Respecting the glass, have the squares cut concave and convex, so that the latter overlap the former, which will carry the water away from the wood. And with regard to the heating, I would say, *have hot water*. Sulphur, *smoke, and uneven temperature* from other ways of heating, are evils not to be desired.



Soap Making.

A Subscriber (*Garston*).—Your wishes have been anticipated.

J. F. (*Anerley*).—Soap is run into moulds, in order to make it into bars and cakes. As it cools, it hardens, and assumes the shape of the mould.

Half Jack.—Perhaps your failure is to be traced to the fact that you used palm oil instead of tallow, and that your soda was not pure caustic soda. I shall be glad to have the paper you propose to write, describing the manner in which you made and heated a plant case in your study window.

Hanging Wall Cabinet.

L. S. C.—I cannot give an illustration of the hanging wall cabinet that you saw in the window at No. 6, *Haymarket*. What would Mr. Booth say to it?

Repairing Bicycles.

Fleur-de-Lis writes in reply to Merry—I have not tried much beyond straightening a crank or handle bar, but find this easy work. The metal must be *bent* by means of a vice, and not *struck* with a hammer, which is certain to crack it. For large repairs it is much safer and cheaper in the end to go to a good professional bicycle-maker, and not to an ordinary smith.

Rambler.—The writer of the articles on "Velocipedes" will take this subject in hand as soon as he has fully discussed the method of making Tricycles and Bicycles.

J. T. (*Glasgow*).—See preceding reply.

Christmas Cards.

K. W.—I am unable to supply the name of the firm in question.

Silver Chasing, etc.

Silversmith.—Instructions on this subject, as well as on repoussé work and other methods of ornamenting metals, will be given in due course, but it is not possible to say at the present moment when the articles will appear.

Horizontal Bar.

S. O. M. S. writes:—With reference to the gymnastic apparatus described in Part IX. of Amateur Work, I would suggest that instead of the horizontal bar being fixed, as shown in the illustration, it should be arranged so as to move up and down, and thus form a bar for vaulting over. This could easily be effected by fastening a stout piece of wood, about 5 ft. 6 in. long, to the front of each of the principal timbers, with holes bored at different distances, both in the outside pieces of wood and the principal timbers, through which a loose bolt would pass, enabling the bar to be shifted up or down. This would give an additional means of exercise. In case I have not made my meaning quite clear, I annex a sketch, showing the end elevation of one of the posts. The blocks, A, A, would have to be made about three-quarters of an inch wider than the end of the horizontal bar, so as to allow free play. The jumping line referred to in the article could of course be put over the loose bolts, which would be used to keep up the horizontal bar.

Varnish for Metal Work.

Romain.—Tea canisters are japanned, and the japan is dried by the action of heat. Green japan grounds are made by mixing Prussian blue and king's yellow with a varnish, and indeed all japan grounds are made in this way. The ground thus made is applied direct to the metal, and after four or five coats have been laid on, the article is placed in an oven heated to 250° from 300° to harden off the japanning. If you only require to coat a small tin, try green sealing wax dissolved in spirits of wine.

Making Wines.

An Organ-Builder.—I regret to say that I cannot see my way to give instructions for making coltsfoot, dandelion, and elderberry wine in the pages of this Magazine. There are so very many subjects which of necessity claim precedence.

Painting on Silk.

F. D. (*New Belton*).—See article in Part VI., on "Satin Painting in Oils." The *modus operandi*, etc., in one case is the same as in the other.

Fluid for Gilding.

Oak Apple.—I am not aware that there are any other mixtures similar to the gold paints known as Judson's and Bessemer's. Why not try the gold shells, sold for illuminating? Gilding with gold leaf is by no means difficult, it is lasting and does not grow tarnished or dull so quickly as the "paints." It would be well to protect such a table as you describe with a plate of glass placed over the work.

Electro-Gilding.

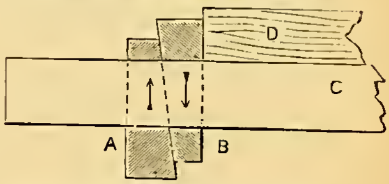
Anode.—Instructions on electro-gilding, nickel-plating, etc., will be given by Mr. Edwinson at some future time. At present other articles that have been asked for claim attention.

Home Made Couch.

C. K. C. (*Queensbury*).—The promise of a design for a couch in imitation of Australian Beech Wood Furniture has not been forgotten, but it has been delayed through pressure of other matters.

Simple Bench Stop.

F. H. L. (*Plymouth*) writes:—I send a sketch of a very efficient and simply constructed stop which may prove of use to some of your readers. It is easily manipulated, being adjusted from the top of the bench, a very slight tap loosens or jams it at any height desired. All blows are struck on the top, and there is absolutely no damage to the bench in its use. Its action requires no explanation, since it consists simply of two wedges, A and B, tightening against one another in a mortise cut for their reception in the bench top, C, the wedges afford a firm stay to the end of the piece of wood, D, laid on the bench top to be planed. I may add that this stop is in use in H.M. Dockyards.



BENCH STOP FORMED OF WEDGES.

Furniture in "Amateur Work."

Baic-a-Brac, who cannot make articles in wood for himself, wishes to hear of some working joiner who would supply articles of furniture, such as the "Bachelor's Sideboard" described and figured in Amateur Work, at a reasonable though remunerative rate.

Postal Photographic Society.

This society, I am requested to state, has been set on foot for the convenience of amateurs for the circulation of private negatives, and for the exchange of photographs and of information on photographic matters. The entrance fee is 2s. 6d., and annual subscription 5s. Further information and a copy of the rules may be had on application to Mr. H. H. Cunningham, Hon. Sec., 7, *Fig-tree Court, Temple*.

Organ Building.

R. W. (*Kirkby Woodhouse*) writes:—For the benefit of amateur organ-builders, I have found Messrs. C. Lloyd and Co., Organ-Builders, *Nottingham*, who do all metal work as well as wood, to be most reasonable in their charges, and a firm which would give every consideration to the wants of an *amateur*.

A. L. D. (*Dublin*) cannot have better or clearer instructions on this subject than those now appearing in the Magazine, written by Mr. Mark Wicks.

New Subscriber.—There is no intention of giving a series of articles on the construction of the American organ.

X. I. V.—Your letter was mislaid and overlooked, for which accept my apologies. You will have seen that the second series of papers on "Organ Building" was commenced in Part XII.

Making Pianofortes.

Pianoforte.—Arrangements are in progress for a series of articles on this subject, and due notice will be given of their appearance.

Pianoforte Tuning.

J. B. H.—The first of two articles on this subject is in hand, and will appear shortly. J. B. H. says: Many people are under the impression that there is a wondrous mystery in connection with tuning these instruments; but the art is much more mechanical than most people imagine, and does not at all depend on an ear wonderfully sensitive for tune, nor on a musical knowledge, but on the mechanical vibrations, and a knowledge of the system of tuning.

Design for Fretwork Machine.

Oak.—Send the design you speak of. When any information respecting timber is wanted, application shall be made to you as you suggest.

Carving in Wood.

C. R. W.—There is a practical school at South Kensington for persons, both professional and amateurs, who desire to obtain knowledge of this beautiful art. There you might obtain working patterns as well as instruction. I cannot tell you whether or not any amateur or professional carver resides in the neighbourhood of New Cross, Lewisham, Sydenham, or Forest Hill.

Staining and Polishing.

W. J. M. (*Chatham*).—(1) See directions for ebonising furniture given in Vol. I., page 461. After having put on the stain, try friction with a rubber of flannel or soft leather. (2) No varnish that I am acquainted with will dry or harden in an hour or two, so as to stand handling without injury. For varnishing boxes, ask for a hard, quick-drying varnish. (3) The only remedy for the disfigured mahogany table is to have the top scraped and re-polished.

Covering Rollers of Wringer.

D. D. M. (*Arran*).—The india-rubber must be vulcanised. Speaking briefly, this is effected by the addition of sulphur. Arrangements are in progress for papers on the method of making india-rubber stamps, and these shall include such instructions as may be necessary for preparing india-rubber for the purpose you speak of.

Construction of Barometers.

W. P. sends the following communication on this subject in reference to the instructions contained in the article, "How to Construct a Barometer," Vol. I., p. 147:—There is no occasion to wash out barometer tubes at all if new, and oil should on no account be used; the only cleaning required, and all damp inside the tube must be avoided most carefully, as it is almost impossible to dry it afterwards, is a clean bunch of cotton on end of a string passed through the tube once or twice, or swab of linen as he recommends. On no account pass *wire* of any kind through glass tubes, as if you do the tube will infallibly break in a short time. The longer limb of the syphon need only be 32 inches, as the range of barometer never exceeds 31 inches. The recent height being the highest known for the last forty years, not exceeding 30·95, the extra length he recommends, 36 inches, represents a terribly extra weight of mercury, and as that metal just now is very dear, a good many pence are saved. The mercury, if bought from a respectable firm, is quite pure enough without being distilled, but on *no account must damp* be allowed to get to it before being placed in the tube. The best way of filtering the mercury is to take a piece of writing-paper and well dry it before a fire, then twist it into a cone with a very fine hole at the bottom exactly like the grocers do up sugar in; a little knack is required for this, but will soon be acquired. Now comes the worst job of all, the filling. Let your correspondent's method be tried by all means, but I fear many will not succeed with it. The usual method is to shake it in, but is a most difficult thing to describe; but if anybody wishes, I will endeavour to describe it. Now comes the only part I can really take exception at, the boiling. Has Mr. M. ever tried to boil a tube in the way he recommends? I think not. He would find the mercury fly out of the tube, and a lot be lost, and most likely the tube burst The proper way is to introduce an inch or two of mercury, very gradually warm tube, and boil mercury, allow it to cool, and add another inch or two, warm, boil, and allow to cool, and so repeat till full.

But, sir, I have been now twenty years in the trade, and have never seen a *syphon* tube boiled; the air is thoroughly shaken out, until when the tube is slightly inclined, the metal strikes the top of the tube with that peculiar click which shows all air is expelled.

If amateurs take my advice, and do not boil, they will save themselves a good deal of trouble and loss, as very likely three or four tubes will fly during the boiling. Thus there is loss of tube, and, what is more expensive, mercury, and I will promise that if the air is well shaken out that the tube will read within two or three hundredths of a standard barometer. Of course these remarks do not apply to pediment or standard instruments.

There is only one more remark on cistern barometers. The wooden cisterns are screwed, and the leather is laid on the bottom, being cut to fit inside the flangs. Now fasten the tube in the top, the end of the tube being level with the bottom of cup-like depression in upper part of cistern. When fastened fill the cistern with mercury up to level with top of cup, part screw on bottom with the leather previously fitted, and you will find it securely held between the two surfaces of the wood. Glue a slip of paper round outside of joint, and it is finished. There need not be any hole in side if done this way, and therefore no glue used that is at all likely to touch the mercury, as if once damp gets in the instrument is ruined.

If the rest of your instructions are carried out properly, they ought to enable any one to make one of these instruments.

Vernier for Barometer.

E. V. (*Bournemouth*).—The Vernier should be $1\frac{1}{10}$ inches in length, and this should be divided into 10 equal parts, each part would then be equal to $\frac{1}{10}$ inch by $\frac{1}{10}$ of $\frac{1}{10}$ inch, that is to say to $\frac{1}{10}$ inch by $\frac{1}{100}$ inch or $\frac{11}{100}$ inch.

Damp in Walls.

Damp.—It is difficult to give directions for stopping damp in walls, without a careful inspection of the premises in order to ascertain the cause. If ordinary means have failed, and you are unable to detect what causes the dampness, have the plastering entirely removed from the damp spots and renewed with Portland cement, faced with Keen's cement, which dries perfectly white. No damp can rise or find its way through this. Let it dry thoroughly before the paper is put on.

Sharpening Tools.

A. S. H. (*Wakefield*).—In setting or sharpening any edged-tool, such as a chisel or plane iron on the hone, keep the tool at the same inclination to the stone throughout the operation. The back iron does not want rubbing. Possibly the surface of the wood was very rough, and this occasioned the first shavings, if they may be called shavings, to come off like sawdust. In planing rough wood use the jack plane first and then finish with the smoothing plane.

Exhibition of Amateur Work.

I. C. S. (*Shepherd's Bush*).—Such an exhibition is desirable, and, without doubt, would pay its expenses, but it requires time and money to start exhibitions and carry them out.

Book-case.

An Englishman (*Boston, Mass.*)—Designs for book-cases of various kinds have been and will be given. In asking for a design, correspondents should give some idea of their special requirements.

French Polishing.

Progress.—Accept my thanks for your instructions on the above process and the preparation of the wood, with design for photo-frame, which shall appear in an early Part. For small locks and catches, write to R. Melhuish and Sons, 85 and 87, *Fetter Lane, London, E.C.*

Paints ready for Use.

Scarlet Bean.—Every oil and colourman now keeps common paints mixed ready for use in tins hermetically sealed similar to those in which meat, fish, etc., are imported. The smallest quantity supplied is 1 lb., and the cost for most colours is 6d.

Old Coin.

F. N. E. (*Southport*) writes:—I think the coin that W. M. inquires about may be a Liverpool Halfpenny. I have two in my possession, which I will describe for his information. The first has on the obverse the arms and crest of Liverpool, viz., the Liver surrounded by the motto, "Deus nobis haec otia fecit," and date 1791. On the reverse is a large three-masted vessel of ancient build, and the words "Liverpool Halfpenny" on the edge is stamped, "Payable at the warehouse of Thomas Clarke." The second coin is similar in design, but on the edge are the words, "Payable at London, Liverpool, or Bristol," and is dated 1794.

Preservation of Eggs.

H. J. A. writes:—While wishing every success to your excellent Magazine, may I be excused if I point out what seems to me a rather ridiculous remark? In the reply to W. B J. on the Preservation of Eggs, Vol. I., page 530, it is said "Lard is better than paraffin for preserving eggs; set them in bran or sawdust, small end downwards." I may tell W. B. J. I have tried nearly all the different ways of trying to keep eggs, and it was never satisfactory. A kept egg is a stale egg and a stale egg may be bought very cheaply—cheaper than we can produce them in our poultry runs. Preserving in lime is about the best way. A paste of freshly slaked lime, I mean. But whatever is done let all strong smelling matter be kept far away from the eggs, for whatever is near them of that will they taste. If the bran is at all musty, then expect musty eggs. If in a deal box, then they will taste of turpentine. If sawdust is used let it be oak, never any wood that has a scent. The cork raspings used by the French in packing grapes would do, any greengrocer would be glad to sell it, for it is only burnt or thrown away. Place the large end downwards. I always found that the best plan, and I had hundreds of eggs in stock at a time; this was some few years ago when I had a large stock of poultry. Your remark about paraffin is simply ridiculous unless it was intended as a joke. Next to milk nothing absorbs bad smells quicker than a freshly laid egg. If W. B. J. wants to know all about poultry, let him get Lewis Wright's "Book on Poultry," published by Cassell's. I have read nearly every book on the subject, and his is by far the best, and may be had in 6d. numbers. Now I hope I shall be excused for pointing out this mistake. Your Magazine is such a good one it is a pity that this reply on page 530 should be there, as showing what appears to be a certain degree of ignorance of the subject, although lard is better than paraffin, I admit. When a paper is so good a small fault is easily detected, and when a thing is so good a fault is the less able to be borne.

Swing Front for Camera.

C. S. (*Clonmel*).—The swing front is not as effective as the swing back. You cannot do better than make a pocket-camera exactly as described in my article on page 65, Part XIII., reducing the dimensions and widths, etc., suitable to your dark slide.

Dynamo-Machine.

J. W. (*Hulme*).—The subject will be treated as soon as opportunity offers.

Transparency for Magic Lantern.

C. T. (*Portman Square*).—You can make a photographic printtransparent byapplying with a tuft of cotton wool the following mixture:—Equal volumes of oil of turpentine and castor oil; but when magnified in the lantern they are quite useless, on account of the enlarging of the texture of paper. To give a full description of the method of making transparencies for the magic lantern would take up too much valuable space in "Amateurs in Council."

Making Corner Cupboard.

L. F. S. (*Barnsbury Park*).—The sides of the cupboard may be dropped into a rebate cut in the slips, as you suggest, or they may be attached by means of narrow mortises and tenons at intervals, the mortises, of course, being cut in the slips. The sides had better be made of $\frac{3}{4}$ in. stuff, and you can groove them into the slips, if you prefer it, but in this case the sides must be rebated to about half the thickness, or $\frac{3}{8}$ in., and a groove of this width cut in each slip.

Joining Waterproof Cloth.

Wellingborough. — Any solution that may be used for this purpose would be supplied by Mr. J. C. Cording, *Ludgate Hill, E.C.*, or by Messrs. P. B. Cow, Hill, & Co., *Cheapside.*

Drilling Holes in China, etc.

F. G. F. (*Horsham*).—In order to drill holes in the bottom of your china flowerpots, you might try the ordinary Archimedean Drill Stock, costing, with drills, about 4s. or 5s. Messrs. Churchill & Co., 21, *Cross Street, Finsbury, E.C*, have some handy drills among their varied stock of tools and appliances, namely, the Whitney Hand Drill, holding drills from $\frac{1}{32}$ in. to $\frac{1}{4}$ in., price 5s., and the Miller's Falls Hand Drill, No. 1, price 5s. 6d.; No. 4, price 2s. 6d., of the same capacity; No. 2 of the last-named drill is larger, and carries drill points up to $\frac{3}{8}$ in. in width. The cost of this is 12s. Drill points are supplied separately at 2s. per dozen. With any of these instruments you can make a number of small holes in close proximity, and then cut away the intervening substance with a file.

Lathing and Plastering.

Talbot.—"Laying" is the technical term applied to the first coat of plaster, whether on lathing or brickwork. "Coarse stuff" is made of equal quantities of lime slaked with water and afterwards evaporated, and clean sharp sand, to which hair is added at from $\frac{1}{2}$ lb. to $\frac{1}{2}$ lb. to every cubic foot of stuff. "Floating" is a term applied to the manipulation of the second coat in three-coat work. The float is either short, in which case it is used for giving a finish or plane surface to the work by moving it in every direction over the plaster while it is soft; or it is long, in which case it is handled by two men, and is passed over the wall in every direction like a long straight-edge, in order that the surface of the wall may be brought to one and the same level all over. "Plasterer's putty" is very fine white lime, well slaked, and formed into a paste with water, which is allowed to evaporate until the preparation is of suitable consistence for working.

Preparation of Floor for Dancing.

Talbot writes:—The floor must first be planed as smooth as possible, all nail heads hammered down, well sand-papered with coarse and then fine paper, washed with new milk, and six hours after, dusted slightly with French chalk. A rough floor may be transformed in an hour by scraping up a common composite candle very finely, scattering it on the floor, rubbing it into the wood with your boots, and then dusting it with French chalk out of a flour dredger. White wax, and then French chalk, is best treatment for a well-stretched drugget, and the chalk will make an over-waxed parquet perfect.

Blacking Brass Fittings.

A. D. C.—It is probable that the brass fittings of your fishing-rod were first black finished and then lacquered. To remove them, clean them and treat them as they were first treated, would be inconvenient, so perhaps it will be best to black them in position as follows: Clean them bright and smooth with wet brick-dust or with wet rotten-stone applied on a rag, then procure 5 dwt. of bichloride of platinum and dissolve it in a tablespoonful of water, or dissolve 4 dwt. of platinum foil in a mixture of 3 drachms muriatic acid and 1 drachm of nitrid acid by the aid of heat. Paint the clean fittings with either of the above solutions, and then dry them before a fire. Whilst each of the fittings are as hot as can be borne by the hand, paint them with best shellac varnish, and dry this hard before the fire.

Dutch Clock

J. P. (*Old Broad Street*).—Instructions for making the above will not be given. If you wish to make a wooden clock of this description throughout, your best plan would be to buy an old one. Take it to pieces and copy the works. The result, however, might not compensate you for your time and trouble. The wheels might be made without a lathe, but they would not be so true as they would be if turned.

Re-browning Gun Barrels.

A. C. (*Gillingham*).—There are various methods by which this may be done. This is one of them:—Mix chloride of antimony with olive oil until it assumes the consistency of thin cream. When this has been done, slightly heat the barrel of the gun, smear it evenly all over with this preparation, which must be left on until the requisite tone is obtained. The markings can be effected by means of a scratch-brush, after which the iron should be polished or burnished with a piece of hard wood.

Inexhaustible Fountain.

C. H St. G. J. (*Maida Vale*).—It has been explained that the fountain described in the periodical you mention is an absolute impossibility, and the error which was inadvertently admitted into "Every Man his Own Mechanic" has been corrected in later editions of that work. Self-acting fountains are described in pages 144 and 383 of Vol. I. of this Magazine. The latter of these, namely, Rushton's Self-acting Fountain, is well worth your attention. Purchasers of this contrivance have expressed their satisfaction with the fountain itself and its working.

Straightening Wire.

J. W. (*London*).—The wire-workers' "riddle," namely, a piece of hard board with strong pegs in it, round which the wire is passed, and then drawn off with tolerable speed with pincers on a piece of wood round which the end of the wire is wound, is as good as anything you can have for straightening wire. There will be a bend in the wire when drawn off, but you will get rid of this when it is cut into short lengths. A bell-hanger straightens copper wire by attaching one end of it to a hook, and passing the wire once round the handle of a hammer, which he works up and down the wire, keeping it as taut as he can during the operation.

Storm-Glass.

R. D. Y. (*Portsmouth*) writes:—I have made, or at least tried to make, two storm-glasses according to instructions given by C. Clarke in AMATEUR WORK for September, but I find that the nitre and sal ammoniac will not dissolve in alcohol, perhaps Mr. Clark has omitted something, as I have carried out his instructions to the letter, and up to the present time the two ingredients are not dissolved.

Artists' Colours.

E. (*Peebles*).—The ordinary powdered pigments sold by the colourman may be prepared for artistic purposes by grinding them finely in linseed oil, on a slab of hard stone, with a glass or stone "muller;" a little driers must be added. Before the introduction of tubes, colours were kept in gallipots covered with bladder, or, in small quantities, simply tied in pieces of bladder. Canvas may be primed with white paint, or for a more absorbent ground, with size and whiting.

Varnish for Leather.

H. C. S. (*Surbiton*).—The following varnish has been recommended for leather:—Sandarac, 2 oz.; shellac, 2 oz.; Venice turpentine, $\frac{1}{4}$ oz.; mastic, in drops, $\frac{1}{2}$ oz.; dissolved in $\frac{3}{4}$ pint spirits of wine, and applied as lightly as possible with a soft sable or camel-hair brush.

Marine Glue.

H. N. (*Argyleshire*).—The following is a recipe for making the above:—Dissolve by heat one part of fine india-rubber in naphtha; when melted, add two parts of shellac, and continue to melt until mixed. Pour the mixture on a metal plate to cool, and when required for use, melt and apply with a brush. A cement for aquariums is formed by mixing one part of resin, finely powdered, with two parts each of plaster of Paris, litharge, and fine white sand. Keep the mixture in a bottle tightly corked, and when wanted for use mix some of it with boiled oil and driers until a consistence similar to that of putty is obtained. It should be used as soon as made.

Patterns for Fret-Cutting.

E. M. (*Leeds*).—I am sorry that you were disappointed with the "Book of Fret Patterns," No. 10, procured from Messrs. Churchill and Co. It is no doubt desirable that the patterns should be supplied separately from the amateur's point of view. Instructions for French polishing have been given in Vol. 1.

Graph Composition.

F. C. (*Carshalton*) writes:—In "Amateur's in Council," page 528, for October, a formula for Graph Composition is given, but I believe incorrectly. It should contain gelatine. The directions are also very vague. I forward a formula I have tried and found to answer. Gelatine 100 parts, water 375 parts, glycerine 375 parts, sulphate of barium, *q s.* about 50 parts. The quantity of sulphate of barium will vary with the different qualities of gelatine. The gelatine is to be soaked in the water until soft, then placed in the glycerine, and gently warmed on the hob, stirring occasionally. When dissolved, add the sulphate of barium in fine powder and mix thoroughly, afterwards pour into a shallow tin tray before it is cold.

Bending Wood.

ESOX.—In order to bend wood it is necessary to steam it You would find it difficult "to bend a strip of wood $\frac{5}{8}$ inch square and 3 feet long into a circle," without special appliances for the work, and success, moreover, depends very much on the kind of wood that is used.

Adjunct to Carpenter's Bench.

HALF JACK writes:—I send a small sketch of a very useful adjunct to the Carpenter's Bench. It may be known to some of your readers, but I have never seen anyone who has heard of it. It consists of a piece of hard wood about 9 inches long, 4 inches broad, and 1 inch thick. Across either end, but on opposite sides, a piece of wood 2 inches wide and 1 inch thick, is nailed; when laid on the bench one end hangs over, and grips the edge of the bench, while the other serves to hold a piece of wood against when using the tenon-saw. I certainly should not like to be without this little article.

Decoration of Door Panels.

W. B. (*Thomastown, Kilkenny*).—No difficulty will be found in working on the varnished panel with ordinary tube colours and ordinary gold size, if it be first well rubbed with a damp wash leather; but a better surface will be formed, and better work made, by rubbing the varnish down with finely-powdered pumice-stone and a leather pad. When the decoration is finished, re-varnish the whole panel.

Stage Scenery, etc.

A. L. (*Birmingham*).—It was not found possible to produce an article or articles on painting scenery, etc, at the time named. The subject will be treated, but it must be deferred till towards the close of the present volume.

Smith's Work for Amateurs.

W. H. R.—This subject and that of wire-working have not been forgotten, and this is all I dare say at present, as far as my experience in arrangements made and broken goes. Your want will be satisfied in time. Remember the old proverb that "Time brings everything to those who are content to wait for it."

Sympathetic Fluids.

W. J. CLARKE writes:—The chemical preparation may be of some interest, as they possess the property of being colourless, or nearly so, when cold, and of assuming a colour when heated:—

1. Half oz. distilled water, 1 drachm bromide potassium, 1 drachm sulphate of copper, pure. This becomes brown when heated.

2. Boil oxide of cobalt in acetic acid, and add a little common salt. This becomes green when heated.

3. Half oz. sulphate of copper, $\frac{1}{2}$ oz. chloride of ammonia (sal ammoniac), and dissolve in water. This becomes yellow when heated.

4. Nitro-muriate of cobalt becomes a most beautiful blue when heated.

5. Boil oxide of cobalt in acetic acid, and add a little nitre. This becomes a pale rose colour when heated.

Any person possessing a sufficient amount of skill so as to be able to draw a landscape may produce a very amusing effect. Let him leave the foliage of the trees, grass, trunks of trees, hay-stacks, sky, and flowers white, and paint the blank spaces over with one or the other of the foregoing preparations. For example, the grass and leaves of trees with No. 2 solution; trunks of trees with No. 1; hay-stacks with No. 3; sky with No. 4; and flowers with No. 5. The sketch, when finished, will have the appearance of a winter scene, all covered with snow. If it now be warmed before the fire, the snow will appear to melt away, and in a few seconds the whole scene will be transformed to one of a beautiful landscape in the height of summer.

"Amateur Work."

J. W. (*Anfield*) wishes that AMATEUR WORK could appear fortnightly, or even weekly, because the monthly form of publication renders it long to wait for a reply to a query or the next part of an article. I fear the appearence of the Magazine at shorter intervals would destroy its distinctive character. It may eventually be produced fortnightly, if the bulk of the subscribers desire it, but at present there is no intention of increasing the frequency of its issue. Attention shall be paid to fancy turnery, and some Supplements given on the subject.

E. R. A. is thanked for his suggestions which shall receive careful attention and adoption wherever practicable. I differ from him, however, in thinking that the articles on "Boots and Shoes: How to Make Them and Mend Them," should be omitted. No knowledge, of a practical nature, be it what it may, can be useless, although it is not everybody that can or will act upon it, and then again in these matters, "*Chacun a son gout.*"

Lathes on the Hire System.

J. W. R. (*Chepstow*).—It has been already stated in "Amateurs in Council" that the Britannia Company, *Colchester*, Mr. J. H. Makin, *Gibraltar Street, Sheffield*, and Mr. Goy, *Fenchurch Street, London*, enable amateurs to purchase lathes on a system of payments by instalments, extended over a period of not more than twelve months.

Boot and Shoe Making.

Dr. G. (*Hyde Park*).—I am not aware of any place where practical instruction in the above could be obtained. It would be easy however, to make arrangements for lessons with any respectable journeyman in the trade.

SILVERSMITH.—Patches on the upper leathers of boots and shoes must be sewn on. Instructions for doing this will be given in the articles on this subject from the pen of Mr. Abel Earnshaw.

Japanning Tin.

W. S. (*Loughton*).—Japanning could not be carried out by amateurs, because the articles thus treated should be subjected to heat to harden the varnish. There is a lacquer for tin, which when brushed over the metal gives it the appearance of brass. This is made by dissolving 1½ ounce of seed lac, 1 drachm of dragon's blood, and ½ ounce of turmeric powder into half a pint of highly rectified spirit. After the lapse of fourteen or fifteen days, during which it should be shaken once or twice a day, strain through muslin. A good varnish for wood or metal is made by dissolving sealing wax of any colour in spirits of wine.

Cutting Mouldings.

E. W. (*Headley*).—You ask, "What is the best tool for cutting mouldings *against* the grain?" I must confess I do not understand your question; but if it be for cutting mitres, I can only suggest one of Booth's mitring machines, or a small tenon saw and mitre-box. The chair rails and lower boards of your dados must be fastened by screws or nails, and the only way to hide the heads of nails is by punching them in and filling up with putty. For heads of screws, holes may be made by counter-sinking, and filled with putty, plugs of wood, in even small ornamental studs or bosses.

Medical Coil.

J. B. (*Rochdale*).—A paper containing instructions on the method of making up a small medical coil is in the printer's hands, and will appear in an early Part.

Size for Varnished Work.

F. P. (*Craydon*).—When using ordinary size for stained work to be varnished, no more water than half-a-pint to a pound of size should be used.

India-rubber Tubing.

C. E. S. (*Holloway*).—If your india-rubber tubing is cracking, the best thing you can do is to replace it with new tubing, cutting out such parts as seem to be sound for other purposes. But if you have made up your mind to try to repair the damage, make a solution of india-rubber by dissolving, say, ¼ oz. of india-rubber in 3 oz. of spirit of turpentine, and fill the cracks with this. Or cut out the parts that are cracked, bevel the ends of the pieces from between which the cracked part has been taken, making the bevel as long as possible, and coat the ends thus treated with two or three dressings of the solution. Each coat must be allowed to dry before the next is put on. When the last coat is dry, bring the two ends together. Information with regard to "Incubators" has been asked for.

Carbonized Bran.

The Californian Fruit Shipping Company, of Vacaville, California, furnishes the following information in reply to a query from an Eastern paper:—"Carbonized bran" is made from ordinary wheat bran burned in a retort, under which treatment all moisture is driven off and a species of charcoal is obtained. This coal bran is used in packing green fruits for long shipment, and the patentees claim that grapes, when thus packed, may be shipped from the Pacific coast to Eastern markets by slow freight with safety, thus avoiding the high charges on fast freight. The company claims that tomatoes have been kept for six weeks when packed in this bran. It is stated that peaches will keep twice as long as under ordinary conditions, but this fruit, having a porous skin, is not as well preserved as other fruits.

Mephitic Vapours from Sewage.

OAKLEIGH writes:—It may not be generally known that some of the mephitic vapours exhaled from sewage are inodorous, so that they cannot be readily detected, but at the same time have a baneful influence on persons breathing them. There is a very simple method used by the United States Board of Health for detecting the presence of these gases, which is to pour into the drain, sinks, etc., a small quantity (say a quarter of an ounce) of the essential oil of peppermint. Wherever the gas penetrates the smell of peppermint will be easily perceivable. The person who pours down the oil should not be the one to search for the smell. The essential oil of peppermint can be obtained at a druggist's, price about sixpence the quarter of an ounce.

Photographic Studio.

G. J. R. (*Chelsea*), writes:—In the November number of AMATEUR WORK, in the article entitled "An Amateur's Photographic Studio, and its Construction," Mr. Parkinson claims to be the originator of the inward sloping side-light. I wish to inform the writer that in the town where I learned the photo business (which is now 10 years ago) there was, and are now, two studios, one built with an inward sloping side-light. I know both the builder and the man whom it was built for, and it turned out very inferior work to the other studio where I worked, which was a perpendicular side-light. I also wish to inform the writer that the above studios are in America, but we need not go so far for proof for I know of one very much older than either of the above, with inward sloping side-light from ceiling to floor, viz., in Knightsbridge, London, so I fail to see upon what grounds the writer basis his claim to originality of the inward sloping side-light. [Like ideas frequently occur to different persons at the same or at different times. Mr. Parkinson, without doubt, has never seen a studio built in the manner which he describes in his article and illustrates in the Supplementary sheet, which is issued with AMATEUR WORK for November, 1882, and thus he takes to himself the credit, and not without reason, of being the originator of the inward sloping side-light Had he known the facts which G. J. R. mentions in his letter he would not have done so.—ED.]

Artistic Modelling.

AN ART STUDENT.—Instructions on this subject will be given in a series of papers the first of which will appear in an early part. Terra-cotta work cannot be carried out by amateurs. The treadle of a sewing-machine can be utilized for working a small lathe and circular saw.

Carpentry at Home.

G. F. (*Saltburn by the Sea*).—It is intended to give instructions on making chests of drawers and ordinary household furniture of all kinds, and as so many correspondents in common with yourself ask for instructions in the simple operations of carpentry, arrangements shall be made for papers on these subjects. Booth's machine for mitring is the best and cheapest with which I am acquainted, and his frame vice is also cheap and useful. These articles were described in Part XII.

Lampblack v. Indian Ink.

G. P. P., in commenting on the method of fixing Indian ink, given in Vol. I., p. 186, writes,—But why use Indian ink? Artists always use lampblack in preference, as more delicate, better washer, easier to graduate, and does not *wash up* when colour is passed over it.

School of Art Wood-carving.

*** We are requested to state that the School of Art Wood-carving, Royal Albert Hall, South Kensington, S.W., in connection with the City and Guilds of London Institute for the Advancement of Technical Education, is open to amateurs as well as to those who intend making wood-carving a profession. To those who are unable to attend the classes, information can be given by letter, and examples supplied. All necessary information, with forms of application and prospectuses of the School, may be obtained by personal application, or by letter addressed to the Manager, School of Art Wood-carving, Royal Albert Hall, Kensington, S.W.

Short Answers to Minor Queries, etc.

E. R. T. (*Prescot*). The paper you ask for has already appeared.—S. H. (*Fermanagh*). The papers proposed would be unsuitable.—H. S. (*Bromley*). Your requirements have been anticipated to a certain extent in the articles on "Electric Bells."—E. J. D. (*Glasgow*). Robert Scott Burn's, "Architectural and Engineering Drawing Book," 2s., published by Messrs. Ward, Lock, & Co., would meet your requirements.—De L (*Shepherd's Bush*). Beyond the scope of the Magazine.—MEDICUS. Your wishes have been anticipated, and your suggestions with regard to other subjects mentioned shall receive attention.—C. T., Jnr. (*Portman Square*). You omitted to enclose the sheet of recipes to which you allude in your letter.—NEMO. Your suggestions are valuable, and shall receive attention. The writers in AMATEUR WORK, avoid technicalities as much as possible.—A. B. Your want has been anticipated.—R. W. (*Anglesea*). No. E. K (*Eardsea*). The subject has been continued, as you will have seen.—J. V. (*Perranzabuloe*). The manufacture of moulds in gelatine is described in the papers on "Casting in Plaster," in Vol. I.—B. W. V. (*Dover*). The "gutta percha solution" you refer to, will probably be supplied by Mr. J. Dicks,

bootmaker, *Holborn, London, E.C.*, to whom you had better apply.—FLEUR-DE-LIS. Your suggestions shall be considered.—G. P. P. A reply has been given to your question on dentistry, under the nom-de-plume which you selected. The difference between AMATEUR WORK and "Every Man His Own Mechanic" is that the former is a Magazine dealing with a variety of subjects of interest to amateurs, while the latter is a work complete in itself, but issued in parts for the convenience of purchasers possessed of slender means.—F. J. H. Fernleaves, etc., between glass are held in place by the pressure of the sheets.—WELL-WISHER. Messrs. R. Melhuish & Sons, of 85 & 87, *Fetter Lane, E.C.*, supply sets of tools in leather cases. See Notes on Novelties, Part X.—J. J. P. (*Belfast*). The temporary discontinuance of the papers on "Photography" was caused by the death of the writer of the first three articles—CRATUR. Practical articles will be given from time to time on modes and methods of making simple household furniture.—J. J. K. (*Brides les Bains*). There are many books on the manufacture of fireworks which the powers that be seek to discourage as much as possible, as being a dangerous pastime.—J. H. (*Barnsbury*). Your suggestions are valuable and shall be adopted and acted on as far as it is possible to do so. The prices of articles and places where they can be procured are generally, if not always, given.—A. L. (*Lee*). I will apply to you when a suitable opportunity offers.—HARGER BROS. The communication to which you refer appeared in "Amateurs in Council." I consider your designs for fret-work, excellent, but personally I prefer designs without figures of men or animals.—P. N. is thanked for his note on the method of making a square hole with an ordinary centre bit. It is, however, only a "catch," which is pretty generally known, but for the benefit of those who may not know it I append it. "Place two pieces of wood side by side in the vice and clamp tight. Bore the hole half a diameter deep, then separate the pieces of wood and j in the bored surfaces, when the hole will be a square one (*i e.*, square at the edge only)—R. L. J. (*Bath*). See reply to J. J. K. (*Brides les Bains*).—J. GILLINGHAM (*Chard*) is thanked for his interesting communication on artificial substitutes for lost limbs. There is no opportunity for using his blocks in the Magazine.—CHELSEA is thanked for his suggestions which shall receive consideration.—M. G. (*Waterbeach*). You will have noticed the description of the articles about which you write in "Notes on Novelties" in Part XII.—H. E (*Clapham*) is thanked for the "enigma in wood" which he sends. If any future opportunity occurs it shall be illustrated and described —W. H. (*Manchester*). Articles on Model Shipbuilding are being arranged for. I cannot say when they will appear.—D. A. P (*Northampton*). The subject of varnish for violins has been exhaustively treated by Mr. E. Heron-Allen —A STUDENT. I trust that an article on making a Microscope will appear at no very distant period.—A. L. A. Your queries with regard to Painting on Porcelain, will be satisfied in the papers now appearing from the pen of Aurelio de Vega, who is an expert in the art.—F. C. (*Carshalton*) is thanked for his recipe for a Shampooing Mixture, but, as it has been stated such subjects are not in keeping with the general character of the Magazine.

Information Wanted.

G. W. B. (*Forest Gate*) wishes for a design for a *window-cleaning chair*, by means of which windows may be cleaned on the outside without risk or danger to the person employed.

J. B. (*Rochdale*) wishes for a recipe for making *gutta percha parings into a cement.*

N. A. R. asks how to make *matches that light only on the box.*

I. H. M. (*Dublin*) wishes for a list of *works on organ building.*

W. J. M. (*Chatham*) asks where *bamboo canes* may be bought.

CARLO wishes to know the best mode of *bending permanently thick bamboo*, say of 1 to 1¼ inches thick, such as is used in the construction of easy-chairs.

G. P. P. wishes to know where he can get *six-sheet white mounts* for drawings at wholesale prices.

L. B. asks how he may *cut the top off a lamp chimney* of annealed glass. A diamond, he says, will not act.

A. T. C. S. (*Dresden*) wishes to be informed how he "can *cold tin some brass and iron articles* without heating them, as they are soft soldered.

G. C. (*Leeds*) wishes for an article describing the best method of making a *baby-jumper* and a *child's go-cart.*

F. M. (*Manchester*) asks if there be any substance or substances that will produce a *lather* similar to that of common soap.

C. H. C. (*Worcester*) wishes to know how to *prepare paper for smoke drawings*, and if brushes are used, and what kind of paper.

EXPERIMENTALIST asks,—"Will any subscriber tell me how to *dissolve vulcanite india-rubber* to a liquid?"

MICROSCOPICAL STUDENT writes for the "necessary information how *to construct a microscope* magnifying about 10,000 times. Also I should like," he continues, "to know what lenses I should require, also the distance they should be placed apart, and the best place to procure them, with the probable cost."

F. R. (*Pimlico*) will be grateful to any reader of this Magazine who will tell him how to make good inks for ticket writing, both red and black, that bought at the stationer's requiring at least two coats before being presentable.

H. J. N. (*Bishop's Castle*) wishes to obtain the address of any person or any firm who would execute for him the *fret-saw work* of some of the designs given in AMATEUR WORK.

IDLOES wishes to know where he may get a *blower* for fixing on to his improved Lester Fret Machine.

C. M. (*Willesden*) wishes to know how he must proceed *to get the bottom cleanly off a glass bottle*, without cracking the other part of it; and also how to *dissolve india-rubber.* He has tried benzoline (*qy.* benzine), and cannot succeed.

T. D. (*Bridlington Quay*) wishes to know where he can buy *a bird-organ*, and the probable price.

TWIO-A-VOUS wishes for a plan of a vivarium about 2 feet long, 1 foot deep, and 18 inches high, with pointed roof, the top and sides to be glazed, and one side to open.

LIGHT asks,—Will some one kindly furnish details and drawings for making a small model dynamo electric machine for two or three lamps.

F. T. (*India Office*), and many of his friends, desire a design with working drawings for a *small wooden mantelpiece with tile panels.* [This subject would form an acceptable and useful Supplement. I shall be glad to receive designs.—ED.]

W. O. wishes to know how to make a pair of chest-expanding braces. His remarks on other matters relative to the Magazine shall receive attention.

J. T. F. (*Brixton*) wishes to know what *cement is used for making cork baskets* and brackets, it looks of a brownish composition, and stands water and damp.

REX ROGATE wishes for a description of the method of making and fitting together a spring mattress. [I am inclined to think that the plan you propose, according to rough sketch, would not answer, that is to say, if I interpret your sketch rightly.—ED.]

J. B. H. writes,—I shall be glad to know how I may make use of the treadle part of a Howe sewing-machine (when the top machinery is removed) into a lathe for turning small woodwork, emery wheel, and any other interchangeable appliances that are useful. I want to know form of casting, fittings, etc. Could a small circular saw for cutting 1 inch boards be adapted?

H. S. (*Dover*) asks,—Can any correspondent give in the pages of AMATEUR WORK, ILLUSTRATED, the dimensions and particulars of construction of the framework of a Canadian birch bark canoe? if so, he would oblige the writer, and probably others. It has been found that such a framework, covered with double canvas, well painted, answers well, as a substitute for birch bark, the canvas is very good.

H. S. (*Dover*) writes,—At the London Exhibition of 1862, were exhibited carpenter's benches of Austrian make, a small but useful size, 2 feet wide by 4 feet 8 inches long being offered at 10s. Does any one know if such are on sale in any part of London now?

SCARLET BEAN wishes to know how he may best re-polish old oak which has been polished, but has been scrubbed and so made rough.

R. W. G. (*Rathkeale*) wishes to be informed how be may make *waterproof cloth*, similar to the Mackintosh coats sold in the shops.

A FISHERMAN asks for instructions on *building a flat-bottomed boat*, such as is used by the Thames fishermen.

RAMBLER asks for instructions (1) for *making (or turning?) wooden tobacco pipes*; and (2) on the method of *polishing stones*, such as madrepores, etc.

W. M. (*Egremont*), wishes for instructions on *making an incubator.*

A. B. (*Galston*) asks if any reader of AMATEUR WORK, ILLUSTRATED, can tell him where he can get a guide to shift to the different angles for a 6 or 8 inch circular saw.

ARTISTIC MODELLING AND AMATEUR SCULPTURE.

By MARK MALLETT.

I.—THE MATERIAL AND ITS MANAGEMENT.—TOOLS AND APPLIANCES.—INITIATORY PRACTICE.

SOME articles on Modelling in Clay, as accessory to Wood Carving, have already appeared in the first numbers of AMATEUR WORK. These articles it is presumed that my present readers will have read. They contain matter which may be perused with profit by the modeller, whatever may be the end to which he proposes to devote his skill; and I shall from time to time have occasion to refer to them, though of course the artistic modelling of the sculptor differs in some respects in its procedure from the directions there laid down.

Those unacquainted with the technical processes of sculpture, are apt to think of it as an art which deals chiefly with the mallet and chisel, and the shaping of the human form from blocks of marble. They are mistaken. Carving is the sculptor's least important accomplishment. A successful and busy sculptor rarely touches the chisel, and when he does so it is only to give some few finishing touches to the bust or statue. His chief work lies in making the clay model, of which the finished marble is but a copy. And this copy is made by workmen—mere masons in the first instance, and in later stages by trained carvers.

It is, therefore, more with artistic modelling than with carving that I shall have to deal in giving instructions to those who seek to become amateur sculptors, though I shall have something to say about carving in its proper place. At first, however, I must devote myself to treating of *Artistic Modelling.*

The Material and its Management.—Any tolerably pure clay, which will admit of being freely worked, is suited for modelling. Its exact colour, owing to the presence of a little iron, more or less, is not of importance. Some prefer a clay which has a warm brown tint. Others like the cool grey of a clay free from iron, such as the Devonshire pipe-clay; and indeed it must be admitted that the latter is the more general favourite. It is perfectly cleanly, being in all essentials the same as the pipe-clay sold in shops for cleansing purposes.

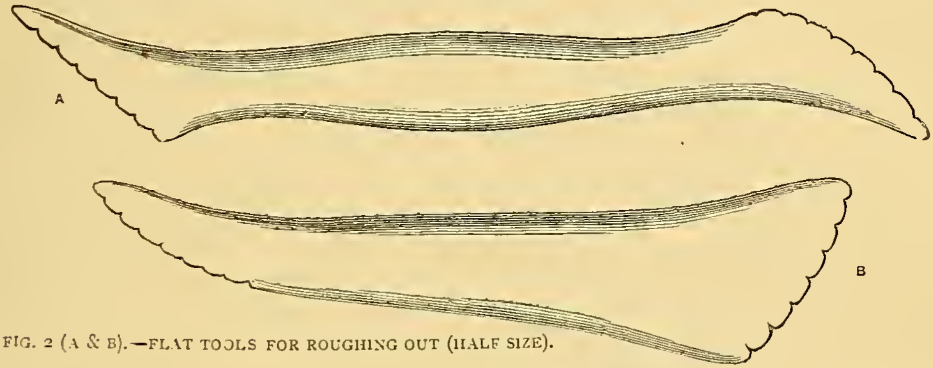


FIG. 2 (A & B).—FLAT TOOLS FOR ROUGHING OUT (HALF SIZE).

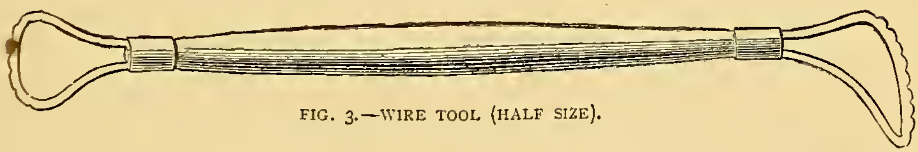


FIG. 3.—WIRE TOOL (HALF SIZE).

At potteries proper clay is to be bought, ready prepared, at about 60s. per ton, in large quantities. Pipemakers, both in town and country, will sell it in small quantities at 1d. per pound. A correspondent of AMATEUR WORK asks for definite information as to where he, living in a remote part of the country, can obtain a supply. For his benefit, and for that of others similarly situated, I may say that Messrs. D. Brucciani and Co., of 40, *Russell Street, Covent Garden*, the well-known plaster figure moulders, supply prepared modelling clay, packed for sending to any part of the country, at 10s. per cwt.

At the wharves in most of our principal towns, and of course at pits where it is dug, proper clay is to be bought in the rough state for a mere trifle (1s. 6d. to 2s. per cwt.). If the worker prefers to get it thus cheaply, he must prepare it for himself. The way to do this is to lay it on a strong, rough table or

bench, and to thoroughly beat every fragment of it with a bar of iron ; and whilst so doing to pick out all stones, and other impurities, which may be found.

Some persons sift in and beat up with it a little fine sand, which tends to make it work more freely. For large models this is decidedly an improvement.

The right consistency of the clay, when prepared, is slightly softer than that of ordinary putty, and nearer to that of butter; it must be in such a state that it can easily be pushed and spread out smoothly by the thumb.

If the clay should be found too soft, exposure to the air will soon harden it ; if it should be slightly too hard, punch a few holes in the lump with your fingers, fill them with water, and wrap the mass in a wet cloth ; but if the lump should be much hardened, the better plan is to break it in pieces, soak it in water and re-beat it.

Clay for use must be kept moist, and as nearly as possible in that state as regards softness which is recommended above. For thus keeping it a box lined with lead or zinc was recommended in the before-mentioned articles. Such a box, with a closely-fitting cover, is not to be improved upon for large quantities, but for the amateur, whose stock of clay will probably be little more than enough to make one life-sized bust, something cheaper and simpler will suffice. Glazed earthen pans are to be bought at the earthenware shops which hold five or six gallons. They are fitted with lids, and cost about 2s. each. Their ordinary household use is, I believe, to contain bread, and keep it from drying. If the lumps of modelling clay are put in one of these pans, the bottom of the pan just covered with water, and the lid adjusted, the clay will keep fit for use for months. At the Royal Academy, where each student has to provide his own materials, all the sculpture students use these pans for their clay. So at least it was in my student days, and I imagine the plan was too good a one to be discontinued. It might be convenient to have two of these pans, one to hold the clay ready for use, the other for soaking such clay as has become hard.

Modelling clay may be used over and over again, and the more it is used the better it becomes. Some of my own stock has been in use for more than fifty years. When a model has been cast, or is for any reason pulled to pieces, it is well at once to break up tbe clay into small pieces, say of the size of walnuts, and put them into a pan or other vessel, with water enough to cover them, that they may soak. For when a model is pulled to pieces, even though it may only have been built up for a few days, the clay will be found too hard for use again without further preparation. But in water it soon softens, and a little beating with the iron bar makes the material as good, and better, than it was before.

In the course of casting, however, some fragments of plaster will be tolerably sure to have become mixed with the clay, and these should be picked out, or they will cause trouble in the next model.

It is better not to let clay which is out of use get quite dry, if it can be avoided. Dry clay, when it comes to be soaked, crumbles down into a kind of mud, which seems for the time to have lost its power of adhesion, and it requires much tempering to bring it back to a proper state for work.

Thus much for the management of clay when not in actual use ; something must now be said as to its management when in the model. Clay if left to itself dries rapidly, and in drying shrinks and cracks. This tendency, if allowed to take its course, would soon spoil the modeller's work.

He has therefore to keep his model constantly damped. For their larger models—statues, groups, etc. —sculptors use a syringe having a rose pierced with fine holes, by means of which they throw water at intervals over their work. For things on a smaller scale the common plan is to fill the mouth with water, and to blow this in the form of fine spray over the model. No other plan wets the model so regularly or well. Those who object to the practice as dirty, can find an indifferent substitute for it in sprinkling with a brush.

After the first day or two (during which the newly-built model will be soft, and need a little drying to make it set) this sprinkling should be occasionally resorted to, and should never be omitted when the modeller ceases work.

On quitting work for the night, or for any considerable length of time, the model must also be wrapped in wet cloths.

Whilst the work is in its earlier stages it is sufficient merely to wrap the wet cloths well about it. But as it nears completion, and when delicate workmanship and finish have been put in, the modeller is chary of allowing the cloths to rub the surface of his clay. He then protects it by sticking wooden skewers, some two or three inches long, according to circumstances, into such parts of his model as have no delicate work which they can injure, and these keep the cloths from touching the surface.

Some, instead of skewers, have a light wooden frame made to fit over their work, and protect it from being rubbed. But this is mere matter of opinion. Skewer holes generally do no harm, and are easily stopped the last thing before the model is cast.

Most modellers like to have a rather fine piece of calico cloth to go first over their work, and a coarse hempen one to wrap outside.

If the work has to be left untouched for several days, it is well to have an additional covering of oil cloth, which, if carefully adjusted, will effectually stop evaporation. Yet it is always better, if possible, to examine your model daily, and to damp it if it is found to require damping. With proper precaution, models may be, and often are, kept in the clay for months, and even years, in a fit state to be worked upon.

In very hot and drying weather a little extra attention is necessary; but cold is a still greater enemy to a model than heat. If the frost once reaches his work, the modeller may be sure that it will make havoc with it—crumbling and disintegrating every part that it touches. Care must therefore be taken not to expose a model to frost.

Tools and Appliances.—As a general remark, it may be said that the best and most useful tool in artistic modelling is the human thumb, and that those artificial tools are most valuable which most closely approximate to it in form. The forms of tools commonly used in modelling are shown in Fig. 1,* and the reader will see in Fig. 1, C, an instrument which answers this description. As the amateur proceeds with his work he will probably find it desirable to have tools of this form in more than one size. They will do the office of the thumb in places for which that member would be too large.

The tool shown in Fig. 1, C, is termed "spoon-shaped," but in one respect its form ought to differ slightly from that of the back of a spoon, it should be rounder and less pointed at the end, like an egg-spoon.

To this and the other tools illustrated in Fig. 1, I must add figures of two others whose value has been approved in practice (Fig. 1, A, B). These are *flat* tools, so that profile views of them will be unnecessary. They are of large size, and their chief use will be for "roughing-out." Instead of buying, the beginner is strongly advised to make his wooden tools for himself. They can be readily shaped from boxwood with a knife, and finished-off with a file and sand-paper. If he copies the four illustrated in Fig. 1, and the two given in Fig. 2, he will have enough to begin with. He will then have learnt how to make others as he may require them, and he will, in the course of his practice, find out the exact tools that he does require.

Bought tools are rarely satisfactory, and to buy a number is generally to waste money and to encumber the buyer with useless articles. Tools are easily made in wood or bone. The chief things to be observed in making them are to leave no sharp angles or points, and to make all curves and curved surfaces easy and true.

A wire tool (Fig. 3) will be needed, and must be bought. It will cost about 8d. It consists of a wooden handle, into each end of which is fixed a piece of bent brass wire, to which a working edge is given by flattening and notching, as shown in the cut. Whenever it is necessary to scoop out a portion of the clay, or to scrape away the surface of the model, the wire tool is invaluable.

For the information of country amateurs, I may mention that such tools may be bought at Buck's, 247, *Tottenham Court Road*, or *Holborn Viaduct*, an excellent tool-shop for all that the sculptor wants. A tracing, or description by post, would probably enable the amateur to get the tool he requires.

For anyone who proposes to model busts and other matters in the "round," a "banker," or modelling-stool, will be indispensable. This is simply a strongly-made stool with a turn-table top. The turn-table, used for bringing any side of work in relief before the modeller, is shown in Fig. 4. Sometimes the pin, which is fixed in the upper part of the turn-table and passes through the hole in the lower, is a large screw, and by means of this the work can be raised or lowered at pleasure. But this is not recommended. Convenient as this arrangement doubtless is, such a stand is always attended with more or less unsteadiness, which is a serious evil. It is really better to raise the model when necessary by putting solid packing under it, such as bricks or blocks of wood; and instead of lowering it, you can always raise yourself by standing on something, which amounts to the same thing. Without the screw, moreover, the banker may easily be made by any amateur or rough carpenter. You require to have it just so high as to bring the face of the bust you are modelling upon it to a level with your own. 3ft. 3in. is a good height for a person of middle stature; about a suitable width would be 14 inches square at top; at bottom the legs should spread two or three inches wider, to give proper firmness.

There are also some minor appliances which cannot well be done without, such as a straight-edge, a foot or more in length, notched like the flat tools at quarter inch intervals. This is for smoothing clay backgrounds. The "claws" in this, as in the tools, enable the instrument to take a better grip of the clay, and leave a better surface, both for holding water and for working upon, than could be obtained without them. Also a plummet; a pair of compasses, for smaller measurements; callipers, which are curved compasses, large enough to measure across the shoulders of a sitter; and a sponge of fine and regu-

* Figs. 1, 4, and 5 have already appeared in Vol. I., pp. 12, 13, in "Modelling in Clay: an Introduction to the Art of Carving in Wood." They are reproduced here for the information of those readers who may not possess Volume I. of AMATEUR WORK, and to save those who have it the trouble of reference, which is not always convenient.

lar texture. As we go on we shall probably find it convenient to add some other matters to our stock of appliances, but these will be better mentioned as we find them necessary.

Initiatory Practice.—It is usual for a course of instruction in sculpture to begin with modelling from the antique, that is for the student to copy casts from the antique statues. This practice has such obvious advantages that I should by no means advise the amateur student wholly to omit it, however desirous he may be of working at once on portraits, or other subjects direct from nature.

Nature would at first present difficulties to the beginner with which he would find it difficult to cope. He would find its constant movements and changes perplex him, as also its colour. The cast, on the other hand, will remain perfectly still till he has mastered it, and will present form without colour—mere light and shade—the qualities with which alone his art will allow him to deal. The professional student spends months, or years, in thus copying the antique. The amateur may content himself with practising it for a little while only, that is till he finds himself fairly able to manage his material, and then go on to something more interesting. And here, I may observe, that for the amateur, sculpture has advantages over the sister arts of drawing and painting. To model fairly well is much more quickly and easily learnt than to draw or paint fairly well. It is in the higher stages of excellence only that progress in sculpture is slower, and that it becomes the most difficult of all the arts. To model a reasonably good portrait, one of sufficient merit to be admitted to the exhibitions of the Royal Academy, demands no more skill than a clever amateur may hope to attain with a year or two's practice.

As a first subject something should be chosen which is large, bold, well-defined, which gives sufficient space for doing most of the modelling with the thumb, and which will not have much small tool-work about it.

A subject which will meet these requirements is the mask (the face only that is) of the well-known Apollo Belvedere, and it has moreover such grandeur and beauty as will make it an interesting study. It is somewhat larger than life size, being, what is technically termed "heroic." A cast of the face may be bought at the plaster figure moulder's for 1s.

Get this cast then—it will be about a foot high—and get a piece of board or slate of sufficient size to form a background for your copy of it. Fix the two side by side, and at the same height, at a convenient angle. Such a modelling-stand as that shown in Fig. 5, will be proper for supporting them, and this you can set on the top of your modelling-stool; or the two can be fixed to a large board, placed on an easel.

You have to arrange them at such a height as will allow you to work comfortably in a standing position. This is important. It is all very well to sit, if you prefer it, later on, whilst putting in minute work or finishing; but you cannot rough-out a thing properly unless you stand, and can thus move freely from side

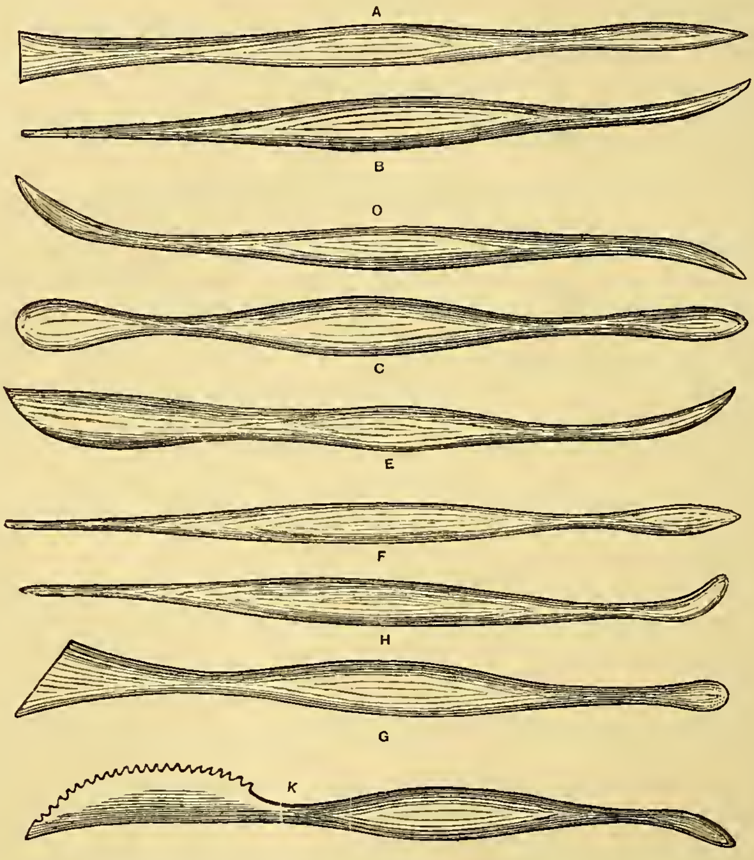


Fig. 1.—Forms of Tools commonly used in Modelling.—A, Chisel-shaped Tool with Bent Point; B, Profile view; C, Double Bent Spatula or Spoon-shaped Tool; D, Profile view; E, Sword Blade and Pointed Spoon combined; F, View from top; G, Oblique Chisel Edge and Greatly Curved Spoon Bowl; H, Profile view; K, Toothed Sword Blade and Bent Point.

to side, and see your work from different points and in different lights.

We suppose you have chosen a slate for your background. Slate makes a good background where it can be used, for it is not liable to warp like board. First damp the surface over with a sponge. This is to make the clay adhere properly. You can then begin to build up the model so as roughly to resemble the form and proportions of the cast.

The best way to do this building up, is to take a slip or roll of clay, say as big as a finger, and lay it against the background. Then with the right thumb, which must be drawn firmly and evenly over it, press it down to its place, and so go on adding and pressing down more pieces till the desired form is roughly approached.

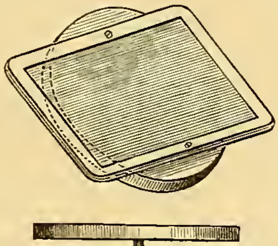


FIG. 4.—TURN-TABLE FOR STAND.

Each piece of clay must be so pressed down as to leave no air spaces between it and the piece beneath and so as to adhere to it closely in every part. This is to be done, and should be done, with a single stroke of the thumb.

And here let me mention a point which cannot be too earnestly insisted upon. It is one with which the learner will do well to impress upon his mind from the very outset. From the very moment that he first begins to handle the clay, he should learn to look upon the thumb as his chief and most reliable tool. The temptation to the beginner will always be to use some artificial instrument instead of it. At first it will seem far more simple to shape his clay with one of his wooden spatulas; but if he will only persevere in using the thumb, wherever it can be used, he will presently find that no other tool is to be compared with it. I have in my time modelled under the instructions of some of the most famous of English sculptors—Foley, Westmacott, Weekes, Calder Marshall, and others—and all were agreed on the necessity of obtaining a mastery over the clay with the thumb as an essential in good artistic modelling.

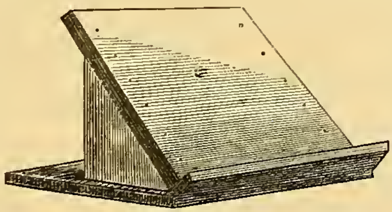


FIG. 5.—MODELLING STAND.

There is a mistake which many beginners make at the outset, especially if they happen to possess some previous knowledge of carving. In roughing-out they are inclined to place a great mass of clay before them, and cut it with their tools into the required shape. They do this either because they do not know, or do not bear in mind, the essential differences which distinguish the arts of carving and modelling. They should remember that whilst the carver cuts down through his material till he reaches the required form the work of the modeller is entirely the reverse, he having to build up his material till the desired form is gained.

This is a second point for the beginner to bear in mind, and whilst doing so he will remember that in roughing-out it is well to keep all his forms somewhat, smaller and especially somewhat thinner, than his pattern: since as he proceeds to finish his model, it will necessarily grow larger with the small pieces which he will continue to add. Of course I do not mean to say that he is never to cut off, or push back, or scrape down. That would be absurd. Accidents and blunders in his work will at times render these operations necessary. But he is to avoid them as much as possible, and, so far as he can, to get the proper forms by adding more clay where required, and smoothing it down.

When the clay model is first built up it is soft, and may be easily pushed in any direction, but in a little while it sets and becomes comparatively firm. The roughing-out process ought to be well advanced whilst it is yet fresh and soft, as in that state any considerable alteration is more easily made.

In roughing-out it is well to keep every part large and broad, and to seek to obtain a resemblance to the cast in the disposition of the great masses only. All details should, as yet, be omitted. The main features may be boldly given with a few touches. The two thumbs pressed into what are to form the eye sockets, and then drawn apart so as to mark the line of the eyebrows serve sufficiently to indicate the eyes. Two depressions made by the thumbs at the corners, and slight lines drawn downwards and outwards give the position of the mouth. A hollow for the opening of the ear, and a sloping line marking in a general way its hinder limit, shows that organ; and so on with other features. And it is remarkable how much of character and resemblance to his original a clever modeller contrives to throw into this rough sketching.

A tendency of young modellers is to build up hastily for the sake of speedy effect, without staying properly to work down each piece of clay as added. This is more haste than good speed. Each piece should be well smoothed down and united to the mass as the worker goes on.

The general masses being accurately arranged, the modeller may proceed to give more detail. After the work has passed its first stage, it will be found an

advantage that the clay should have "set," and the model become comparatively firm, for had it remained in its soft state, it would have been too yielding to have allowed of any delicate workmanship or careful finish. It is well to keep working over the whole of the model, and not to bring any part into a markedly more advanced state than the rest.

In the more advanced stages of the work, the modeller generally rolls up the small pieces of clay which he now uses in the form of little pellets or cylinders, between his hands or his thumb and finger. This makes them more convenient of application, and at the same time tempers the clay, and makes it work more smoothly, which is now of importance. As the model grows into shape, it will be found desirable to turn the stand or easel occasionally, so as to bring cast and work under new lights. This will enable the student to find out many errors and shortcomings, which otherwise might have passed unnoticed.

And here I must say a few words on the subject of light for modelling in. By day it is better to work before a window, the bottom of which is at a higher level than your stand. In sculptors' studios it is thought best to have the windows very high, and looking towards the north. That aspect is preferred, because the light is then more regular than it could be if the direct rays of the sun entered, as they must at times do from the other three points. A skylight throws strong shadows, brings all forms boldly out, and is for that reason pleasant to work at ; but it has this disadvantage, that models made under it rarely look satisfactory when removed to other and less forcing lights. If the modeller has only a low ordinary window at which to work, he may improve his light by placing a dark curtain across the lower half of it. For modelling from the plaster cast, gas or strong lamp light is even better for the student than daylight, since it throws stronger and more clearly-defined shadows.

In elaborating the smaller details, as in the mouth, eyes, etc., a little spoon-shaped tool must chiefly be used. When modelling the eyes, it is better first to make out the general swelling of the eyeball, then to add the upper lid, and lastly the lower. In working on the hair, tools of various shapes must be employed.

When the student feels satisfied as to the fidelity of the forms of his copy in all its parts, his last work will be to give a good and finished surface to the whole. A good modeller can finish his flesh-modelling with the thumb alone ; but this he can only do as the result of long practice. It will hardly be possible to the beginner. His surface is sure to be "lumpy." Instead of broad, regular, even curvatures, it will be full of little lumps and hollows. As practice gives him the mastery over his material, this defect in his workmanship will disappear. Meanwhile, if he wishes to make his model presentable, he may improve it by having recourse to a mechanical help.

Let him get a piece of the ribbed texture of which cotton stockings are made. It should be tolerably coarse. This he should wet and wrap over his thumb. If he then draws his thumb firmly over the surface, the ribs of the cloth will cut slightly into the clay, and bring his flesh to a more true and regular appearance. This will leave the work somewhat disfigured by the rib marks, but these may be removed, and a satisfactory surface given by dabbing lightly with a fine sponge, slightly wetted.

These, however, will only apply to the broader surfaces ; but the finer parts, such as the mouth and eyelids, may be smoothed and softened down first with a moderately stiff hog-hair pencil (termed a "hog-tool"), and then with a camel-hair, both dipped in water. In finishing, nothing about the fleshy parts of the model must be left harsh or crude. A soft and broad effect is the quality which should from the first be aimed at in artistic modelling. The amateur is sure to be so well pleased with his first effort as to wish to preserve it. This he cannot well do in the clay, as it will in drying be liable to shrink and crack, and when dry to be broken at every touch. He must therefore cast it in plaster of Paris. For the practice of this branch of the sculptor's art I have already been allowed to give full instructions in AMATEUR WORK (see Parts 8 and 9, Vol. I.).

It will be well that the first model should be kept. Not that it will be worth the plaster which goes to form it, but that by and by it will serve to indicate to the modeller the extent of his subsequent progress.

In my next article I shall be able to go on to modelling from the life, to the production of portrait medallions and busts, and to speak of the mode of procedure with regard to ideal sculpture.

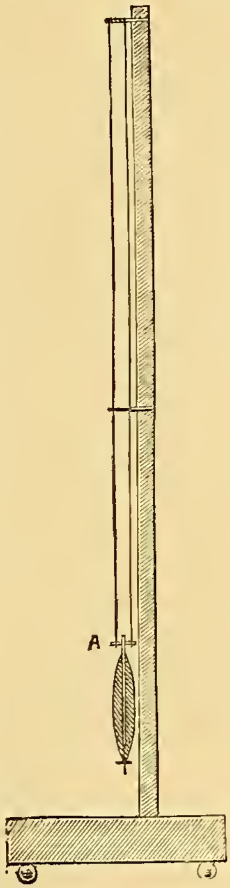
(*To be continued.*)

MECHANICAL ASSISTANT FOR AMATEUR ORGAN TUNERS.

By HERBERT CLARK.

THE simple apparatus which I am about to describe, and which I have practically tested on several occasions, is based on a knowledge of the number of *beats* or *waves* which are heard when any interval other than an octave is played on an "equal temperament" instrument. When using this apparatus,

tuning is effected by "fifths" and "octaves" only. Starting at F in the bass clef on a stop of normal pitch—a diapason for instance—and ascending by semitones through a complete octave, we find that the beats occurring in the successive fifths during ten seconds of time are 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, and 22 respectively. The apparatus consists essentially of a pendulum capable of being readily adjusted to beat similar numbers of times during the same period. In its simplest form, a piece of hard wood, about 46 inches long, 3 inches wide, and 1 inch thick, is mounted vertically and rigidly in any convenient manner; in a line down the centre of one of the broad faces of this piece of wood, a series of $\frac{3}{16}$ or $\frac{1}{4}$ inch holes are drilled quite through, as follows: a mark is first made at about 6 inches from the bottom end of the board, and the holes are then drilled at 8·1, 9·7, 10·8, 12·0, 13·6, 15·2, 17·4, 20·0, 23·2, 27·1, and 32·2 inches respectively from the mark. Care must be taken to make these holes at right angles to the face of the board.



MECHANICAL ASSISTANT.
SIDE ELEVATION.

Three pieces of brass or iron rod are now required of such a size as will fit the holes just made without perceptible shake—one, at least, must be a good fit, the others are of less importance, but look better if of the same size; two of these pieces are to be made 3 inches long, and the other 1½ inch; at a quarter of an inch from one end of each piece a very small hole is to be drilled transversely through with a watchmaker's pivot drill, and another similar hole parallel to the first is to be drilled at 1 inch distance from the first hole. One of the long pieces is now to be somewhat tapered at the undrilled end, and tightly driven into the vertical board near the top, and in a line with the series of holes. The other long piece, the well-fitting one, will require half its thickness filed away at the drilled end for half its length at right angles to the holes drilled in it.

A pendulum "bob" of four or five pounds weight, having a sliding bar passing through it, with screw and nut for adjustment, must now be procured, and the short piece of rod attached thereto, as shown at A in the figure.

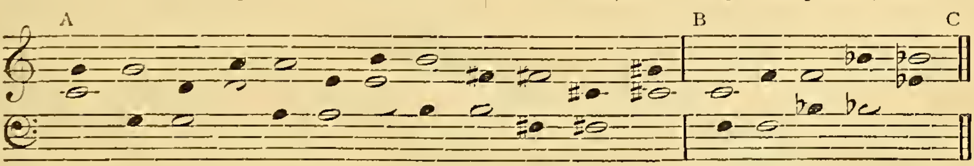
Two pieces of very thin steel wire are now passed through the holes in the short bar, and securely fastened with a touch of the soldering bit on the underside. The wires are then passed through the loose bit of rod, taking care to keep the flattened side next the "bob," and then through the bit of rod fixed in the top of the board, being finally secured in such a position that the centre of the "bob" shall be exactly opposite the mark made at 6 inches from the bottom of board. The screw adjustment of the "bob" will be found useful here.

We have now a pendulum capable of being adjusted to any required length with the greatest ease. If we now mark the holes in the vertical board as follows, beginning from the bottom, our apparatus will be complete: E—B, B♭—E♭, D—A, C♯—G♯, C—G, B—F♯, F—B♭, A—E, G—D, F♯—C♯, and C—F.

We now proceed to the tuning of our organ. If it has only one stop—a diapason, or other stop of normal pitch—we take "middle C" as our foundation note, and tune it to a fork of the required pitch; while, if our instrument possess a "principal" stop, we first tune that stop, commencing, however, an octave lower.

The following is the order to be observed in tuning, the white notes being supposed to be tuned, and the black notes being tuned to the white in the succession shown.

All the *octaves* must be made perfect. The *fifths* from A to B are first to be made perfect, and then the black notes slightly *flattened*, while from B to C the black notes, after being made perfect, are to be slightly



sharpened. Here our apparatus comes to our aid, and indicates at once the exact amount of flattening or sharpening required.

Suppose we are tuning the first fifth, we press down the C and G keys, and if the pipes represented by those keys are nearly in accord, we hear a distinct

succession of waves, more or less rapid in proportion as the pipes are farther from or nearer to perfect accord. We therefore sharpen or flatten the G pipe until perfect accord is secured, no wave being then perceptible. We now insert the movable pin in the hole marked C—G, and, with a touch of the finger, set the pendulum vibrating, and, glancing at the swinging pendulum, we gently flatten the G pipe until waves are produced which keep exact time with the beats of the pendulum.

We proceed in this way until all the notes contained between, and inclusive of, the F below and the B above our starting note have been tuned, after which we proceed to tune the remainder of the stop in octaves from the "bearings" thus laid. If this part of the work—the "laying of the bearings"—is carefully done, the result is sure to please, and it will be found that much time is saved by the use of the simple apparatus above described, since no step of the work need be gone over a second time. It will be found convenient as we proceed in "laying the bearings" to tune the C in the treble clef, and the C, C♯, D, E♭, E, and G♯ in the bass clef, as we arrive at their several octaves, for by so doing we complete the middle two octaves, and have a good opportunity of testing the soundness of our work by playing a few "trial chords."

In conclusion, permit me to add that if any difficulty is experienced, either in understanding or carrying out these instructions, I shall be most happy to render any assistance which may be needed, in "Amateurs in Council."

HOW TO REPLACE AN ORDINARY BROKEN SASH-LINE.

By H. C. T.

THIS operation, although very simple, is more than many amateurs would attempt without some previous direction, whilst to others any explanation of a work that is to them exceedingly easy may seem altogether superfluous and uncalled for.

There are probably very few persons but who are aware of the annoyance and inconvenience of a broken sash-line, although this annoyance mostly falls upon the housekeeper, or domestic portion of a family, whose tempers are not unfrequently ruffled by many trifling things which, with very little exertion on the part of an amateur mechanic, might easily be rectified. For such as are unacquainted with the means to be employed for carrying out the above operation, a few remarks in explanation thereof will not be unwelcome, especially to those who, living in country places, are prevented from having even such slight matters put right without having to send perhaps a considerable distance for the necessary mechanic.

To begin, then, all the tools generally required, consist of a hammer, screw-driver, pair of pincers, and a bradawl, a few clout nails and brads, and, of course, the new sash-line; besides these a simple appliance known to mechanics as a "mouse," easily made, and described further on, is generally used, though not absolutely necessary. With regard to the line, the size of this depends on the size of the wheels over which it passes, and, of course, the weight of the sash. For ordinary sashes the size known as No. 5 will be found most useful, for small sashes, Nos. 3 or 4, whilst for very large sashes, or those glazed with plate glass, Nos. 7 or 8 will be required.

We will now pass to the window itself, and note its construction. Fig. 1 shows a section of the frame as usually fitted in modern houses. The pulley style, A, is that in which the pulleys or wheels over which the line passes, are fitted, and the pocket piece (described further on) cut. The front bead, E, is generally called the "five-eight bead." The parting bead, F, acts as a guide to the sashes, and keeps them apart, while the parting slip, G, fills the same office for the weights. The other portions of the frame will not concern us much in this operation. To simplify the explanation, we will suppose that the left hand line of the bottom sash only requires renewal, the same process would of course apply to any of the others.

First remove the left front bead, E, by inserting the point of the screw-driver between it and the frame, about the middle, and forcing it outwards, springing the ends from the top and bottom mitres (if properly put together there should be no nails in it within a foot of either end to allow of easy removal); then lift out the sash, allowing it to hang by the unbroken line, or rest it on a chair as far away to the right hand as convenient. Then take out the parting bead, F, in the same manner as the front bead, but no nails whatever should be found in this; the removal of this is requisite in order to take out the pocket-piece before referred to, whose position and construction is shown and explained in Fig. 2.

This is simply a loose piece cut in the pulley style to admit the weights, and obtain access to them. It is not fixed or nailed in any way, but simply held in position by the parting bead, F, passing through the groove, as shown in sketch. By inserting the point of the screw-driver or bradawl at the bottom joint, B, and pressing downwards, it ought to fall out readily; if not, more force must be applied. Having removed this, the weight will be visible; having fallen to the bottom of the frame, take it out and remove the broken piece of cord from the hole,

The next step brings into use what we have spoken of as the "mouse," although, with patience, the cord might be pushed through the pulley, and down the frame to the pocket without its use, but the mouse (Fig. 3) greatly simplifies the matter. It is usually made by doubling up a small piece of sheet lead into a strip about $\frac{3}{16}$ or $\frac{1}{4}$ of an inch square (or round), and about 3 inches long, one end of this is flattened and a small hole drilled in it, to which a piece of string, three or four yards long is tied. The mouse should be bent into a crescent shape to enable it to pass easi'y over the pulley wheel, over which we now pass it, allowing it to drop inside the frame and down to the pocket, where it can be withdrawn. The end of the new sash cord, being tied to the other end of the string, is easily drawn through the pulley and down through the pocket. Then take the weight and pass the end of the new cord down through the hole in the top, and tie a double knot which should be well hammered into the space intended for it in the weight, to prevent its catching in passing up and down the frame. Of course, the mouse would be first detached, having done its part in drawing the cord into position. Next replace the weight in the pocket, taking care that it is on the right side of the parting slip, G, otherwise the two weights will stick fast, then draw it up to the top of the frame as far as it will go, and cut off the cord about a foot or eighteen inches from the sill, or bottom of the frame. While in this position the bradawl may be driven through the cord near the top, and into the pulley style to hold the weight in the same place leaving the hands at liberty to fix the cord to the sash. Before this is done, replace the pocket-piece and parting-bead, driving the latter tightly into its groove which should hold it firmly without any nails. Now lift up the sash to a convenient position, and having

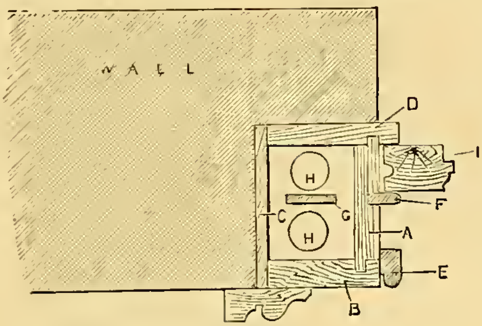


FIG. I.—SECTION OF SASH FRAME.
A, Pulley Style; B, Front or Face Lining; C, Back Lining; D, Outside Lining; E, Front Bead; F, Parting Bead; G, Parting Slip.

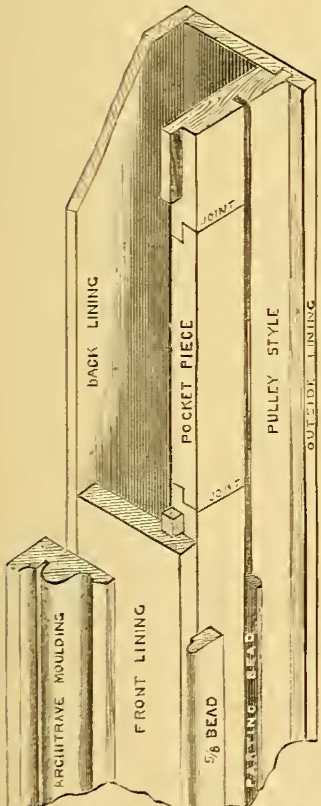


FIG. 2.—DIAGRAM SHOWING POCKET-PIECE.

FIG. 3.—MOUSE.

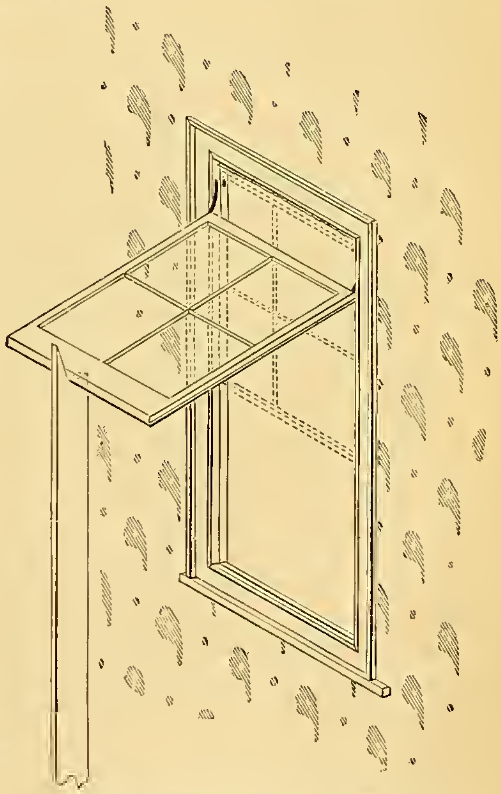


FIG. 4.—DIAGRAM SHOWING HOW TO PROP UP BOTTOM SASH TO REMOVE TOP SASH.

removed the broken pieces of cord from the groove in it, place the new cord in, and securely nail it with two or three clout nails, which should not be too long or they will pass through the wood, and probably fracture the glass ; 1 inch clouts are generally used. Care must be taken, and especially when putting a new line to a top sash, that the top nail is not driven too high to interfere with the run of the line over the pulley ; for instance, if the pulley is 6 inches from the top of the frame, the top nail securing the cord to the sash should be 7 or 8 inches from the top of the sash. Now remove the bradawl, and place the sash in its proper position in the frame, running it up and down a few times to see that all is right, then replace the front bead, allowing sufficient space for the sash to work easily, but not too freely so as to rattle; and if any nails are required, they should be driven at least a foot or eighteen inches from the ends, to allow of easy removal at a future occasion. A better plan, and one that ought to be more generally followed, is to secure these beads by means of screws.

This concludes the whole process, and although taking many words to explain, it may be carried out by any amateur in half-an-hour, or less.

Should the top sash only require a new line, proceed as in the other, but as the bottom sash comes first this must be put out of the way somehow. The best plan to do this is to run it up to the top of the frame, then swing it inwards into the room, the lines acting as hinges, and fix it up by a prop from the bottom rail, as shown in Fig. 4. Any piece of wood, or even a broom handle, will effect this ; but as a slip would undoubtedly cause a breakage, it will be safer to cut a piece of wood with a V shaped end, as shown, than run any risk.

The sash-line can be purchased at any ironmongers, or general shop, in lengths of twelve yards, called "knots," at prices varying from 6d. upwards per knot, according to size and quality. The best sash-cord is made of flax plaited. Amateurs requiring sash-cord for repairs should get Austin's "Patent Flax Sash Line." The most useful sizes are Nos. 4, 5, and 6, which are sold respectively at 7d., 9d., and 11d. per knot of 12 yards.

In some very old frames the pocket-pieces are sometimes found cut in the front lining instead of in the pulley style. This will easily be discernible, and will not alter the operation; but in this case when the bottom sash only requires a new line, it will not be necessary to remove the parting bead at all. In many new frames, also, the pulley styles are not grooved and tongued into the linings as shown, but should be so found in good work; and where this is the case, the tongue is generally cut off the pocket-piece to allow its withdrawal.

JOINTING WOOD IN ALL ITS BRANCHES.

By JOSEPH COWAN.

III.—HOW TO JOIN THIN WOOD.

HALF-INCH and three-eighth inch stuff is jointed in the following manner : If for drawer-bottoms, panels, and such-like, prepare your work to size, and trim all faulty parts away ; make up to size required, and number the joints (with chalk), pile them, crossing each set ; this will prevent confusion, and facilitate the work. The amateur is supposed to know the use of a shooting-board, and how to put a trying-plane in order, which ought to be sharp for "jointing." Beginning with No. 1, shoot the piece on the left-hand with the number up ; the one on the right, number down. If both edges are straight, you have a "joint" ready for gluing ; but, to make sure, place them edge to edge, to see if the "joint" is a shade hollow, which causes a slight "cringing" at the ends. Be sure of your first joint, then make that a guide for all the rest. It is very essential that the numbers are, when shooting one up, the other down, in the same "joint," otherwise the work will not be level on the flat. Go through the whole course before gluing. In gluing-up thin stuff, the "joints" are not to be warmed, as the fire will twist them. Do not grip the piece bodily in the bench-stop, but at *one end*, in a fixed hand-screw, the glue being moderately thin and quite hot ; glue both edges quickly, but steadily, with the loose piece leaning aslant against the fast piece. Now place upright, and rub lengthwise, quick, till it feels as though all the glue was rubbed out of it—the closer the better the "joint. While rubbing, keep your fingers as low as possible, to prevent toppling over, which must not be allowed at the finish. If the toppling cannot be avoided, glue again, and, if necessary, thin the glue by dipping the brush in the hot water, then into the glue again ; but try to make the first gluing a success, as it is always the best.

When $\frac{1}{4}$ inch stuff is being manipulated, all the foregoing is applicable up to the gluing process. But your work will require supporting with a board leaned against the wall, nearly upright. Place the first piece edge on the floor, flat, resting on slanting board, glue (one edge only), and rub as before. It must rest five minutes before removal to glue another.

I will now tell amateurs how to make a "glue-brush" that will not lose its hairs, or stick to the side of the pot. The best, cheapest, and most durable and effectual glue-brush is made from a piece of rattan cane. Pare the outside crust off, dip the end in boiling water, then hammer out (on wood) till the

fibre is well separated, especially at the point. If made in three or four sizes, this kind of brush will serve every purpose except large veneers, which will require a paint-brush, according to the size of the work.

In order to make tongued joints in above-mentioned thicknesses, shoot the joints as above, then groove-and-tongue with a pair of piecing-planes, to match the thickness of the stuff, always keeping the fence of the plane to the face, or numbered side, of the work. Piecing or grooving-planes are liable to lean or work off to the right; so the cure for that is to exercise pressure to the left. Examine each joint, when made, to see if it is straight both ways, or your work, when glued, will cut a sorry figure. These joints are applicable to any thickness of stuff, and can be put together dry or glued; when for gluing, the tongue must be slack to allow for swelling when the hot glue is put on. This is done in two ways: close the forked iron of the tonguing-plane a very little, or have two irons for the grooving-plane—one for dry, and the other for glued joints; then your joints in both cases are correct. To a new beginner these joints will be a little troublesome; but the excellency of the work will well repay any amount of painstaking, for the jointed part, when glued, will be stronger than the solid wood.

The next chapter will be on "Jointing and Laying Veneers," and this, probably, will bring my remarks on this branch of the carpenter's and joiner's work to a close.

(*To be continued.*)

PICTURE FRAMES IN FRETWORK.

By J. GRAHAM.

THE fretwork picture frame, illustrated in Fig. 1, was designed to mount the "Art Journal" engravings and other pictures of the same size, and as some few hints deduced from my experience in cutting it out and putting it together may be of use to those who intend to make one, I append a slight description of the method I most favour.

In the first place as to choice of wood.

A good deal depends upon the paper of the wall upon which it is intended to hang the frame when completed. American walnut, either polished or simply oiled, makes a handsome frame, suited to most papers; vulcanite also has generally a pleasing effect, but I incline rather to whitewood generally, and to horse-chestnut in particular, as the most effective of all.

To further improve the appearance, the frame should be backed with velvet. Here, secondly, the surroundings and the taste of the fret-cutter may well be consulted. I have found that the colours most suitable for backing whitewoods are: brown, light crimson, dark crimson, maroon, and black, of which black where allowable is infinitely to be preferred, as the pure white of horse-chestnut stands out from it as if it were ivory.

Thirdly, having accepted horse-chestnut, say, as the wood to be worked, we must consider what thickness we should use. It should not be greater than $\frac{1}{2}$ inch. Personally, I prefer to cut it out from $\frac{3}{16}$ inch, and use $\frac{1}{2}$ inch yellow pine for backing, as will be afterwards described. Perhaps I might add that should any difficulty be experienced in obtaining horse-chestnut of suitable dimensions, Messrs. Booth Bros., of Dublin, can supply any quantity required on most moderate terms.

Fourthly, as to the method of cutting out the frame.

It should be cut from a single piece of wood, the grain running in the breadth if of whitewood, but the grain must be in the length for appearance' sake, if of walnut or other wood having decided markings. The frame may also be cut in four parts, joined at the mitres with a little glue, and needle points, used as dowels, the lines of juncture being hidden by overlays, cut out and glued or screwed on (from the back). This, however, should be but a *dernier ressort*, when the amateur's saw will not take in the work in one piece. Some little care will be required in the actual cutting to prevent the unsupported scrolls at the sides from being broken, especially when working in thin wood. One way of overcoming this difficulty—and one that I have successfully practised—is, to cut two frames at the same time, the top one being, say, of whitewood and the lower of walnut, the grains of each running in a different direction, the separate pieces being held together by means of needle points or short tacks. Another plan advised in a book on fretwork I have lately seen—but which I cannot recommend—is to paste thick brown paper, or thin cardboard, underneath; in our case I believe it would be just as difficult to remove the paper without breaking the scrolls as to cut them without it. Referring to the design, it will be seen that a broken line is drawn round the solid part of the frame about 1 inch from the inside edge. This line marks the rebate for the picture, glass, etc. Several plans can be adopted for this, two of which I may mention When the frame is cut out in thick wood, it is better to glue a slip of wood to the back of the frame all round so as to form a rebate; but with thin wood, a totally different plan should be followed. A separate frame should be put together of $\frac{1}{2}$in. timber, it may be in one piece, but would be stronger if mitred or put together with mortise and tenon. Its outside measurement should be 2 feet by 1 foot 9 inches, with an aperture 12$\frac{1}{2}$ inches by 9$\frac{5}{8}$ inches. Supposing it done, as

FIG. 1.—PICTURE FRAME IN FRETWORK. BY J. GRAHAM. ONE-THIRD SIZE.

the mathematicians say, round off the outside edges somewhat, very slightly will do, only just sufficient to prevent the velvet, which must be glued to it, from being cut. Tack down the velvet to the back, screw home the rings to carry the cord, glue the fretwork frame in turn to the velvet—the addition of a few screws put in from the back is desirable. When all is firm, and glue cool, the glass and picture may be dropped into their places, the backing added, and the whole covered with brown paper, well pasted down, to exclude the dust.

Our frame is now finished; if carefully and well done, it will, I trust, be found fitted to occupy a place on even the drawing-room walls.

FIG. 2.—PICTURE FRAME IN FRETWORK. BY "PROGRESS." THREE-FOURTHS SIZE.

The above frame (Fig. 2), from a design by "Progress," forms a suitable accompaniment to the preceding design by Mr. Graham. The incised veining of the leaves gives expression to the work. A little more cutting with a carving chisel would give individuality to the leaves, if preferred, and effect *quasi* separation from the inner rectilineal portion of the frame. As given here the frames are suitable, or nearly so, for cartes de visite. They may be enlarged or reduced with little trouble, to suit pictures of any size.

ORGAN BUILDING FOR AMATEURS.

By MARK WICKS.

(*For Illustrations, see the Supplement to this Part.*)

III.—SOUND-BOARD, WIND-CHEST, PALLETS, ETC.

WE now commence on what appears, from a casual glance at the sheet of details accompanying this article, a rather formidable undertaking, but it will not be found to present any great difficulties or to occupy a very long time. The chief requisites are good materials, the ability to plane a board true, and the exercise of a little care and patience.

The sound-board of an organ—the term is a misnomer, for it is in no sense of the word a sound-board—is merely a flat board, termed the "table," which is divided by wooden partitions, on the underside, into as many channels as there are keys in the compass of the instrument. The wind is admitted into these channels by means of valves, called pallets, from a box underneath, termed the wind-chest. On the top of the table are flat slips of wood called sliders, running between other flat and fixed slips, termed bearers; over these are thick boards, termed the upper boards. Holes are bored down through the upper boards, sliders, and table into the grooves, the pipes being planted over these holes, and if the slides are open the wind passes from the wind-chest into the channels and from thence into the pipes. When the sliders are closed no wind can pass into the pipes.

The first thing necessary is to make a drawing board, for without this you would be liable to spoil all your work. So prepare a board of ½ inch pine, 6 feet long, and 2 feet or more wide, and on it set out, to full size, the plan shown in Fig. 1, on the sheet of details. This is for the organ described in Specification 1 in Chapter I. (Vol. II. p. 21).

The outside measurements are 5 feet long by 2 feet wide, so mark these lines first, and then draw another at each end 1½ inches in, to show the thickness of the end bars or cheeks: the front and back cheeks are each 1 inch thick. Now draw the two thick bars dividing the treble from the bass, the centre of these divisions being 21¾ inches from the bass end. These bars may be about an inch thick with a space between them, or the division may be one solid bar 2½ inches thick. The bass portion is now to be divided into twelve channels, and eleven partitions, or bars, in the following manner:—The first two channels and one division occupy 3 inches, the next three channels and four divisions take 6 inches, the next three channels and three divisions take 5 inches, the remaining 4½ inches being divided into four channels and three divisions. The channels in the bass may be slightly wider than the bars. Commencing now on the treble side of the thick bars, we have four channels and four divisions in a space of 5 inches; then four channels and four divisions in 4 inches; next four channels and four divisions in 3½ inches, then seven spaces and six divisions in 5½ inches. Now mark a bar 1 inch thick, and on the other side of it six spaces and six divisions in 4 inches, and then fifteen spaces and fourteen divisions in 7½ inches. The remaining 5½ inches is occupied by four spaces and four divisions, these really being for the first four notes of the tenor octave, which are placed at this end of the sound-board for reasons which will presently be explained. In the treble portion of the sound-board, the divisions, especially the very thin ones, should be wider than the spaces, in order to allow a firm seating for the pallets. Having marked out all these lines carefully, score over all the bars and the cheeks in order to prevent any mistakes being made hereafter.

We may now proceed to mark out the sliders and bearers. The two outside bearers are each 1½ inch wide (measuring from the outside edges of the cheeks) and these may be drawn from end to end of the sound-board. Then, commencing from the back of the treble portion, set off a width of four inches for the width of the open diapason slider, and draw the line for it, allowing it to run 3½ inches over the end of the board. Now mark a bearer 2 inches wide, a slider 3 inches wide for the keraulophon, then a bearer 1 inch wide, and a slider 3 inches wide for the stopt diapason. Draw another bearer 2 inches wide, then a slider 3 inches wide for the flute, the lower line of which you can carry right through the bass also. Now set off a bearer ¾ inch wide and a slider 2¼ inch wide for the flageolet, continuing these lines also through the bass, and thus, with the outside bearer already drawn, completing the width of the sound-board.

On the bass end, now set out, after the outside bearer at back, a slider 4¼ inches wide for a stop termed the "Violoncello," which will shortly be described, then a bearer 2 inches wide, next a slider for the stopt diapason-bass 5¼ inches wide, a bearer 2 inches wide, and a slider 4½ wide for the flute bass, the lines for the next bearer and slider have already been drawn through from the treble. This completes the setting out so far, and we have now to show the positions of the several pipes. The pipes stand in double rows over each alternate channel, as shown in the sketch, the larger pipes being placed back to back, but should not touch each other. With the smaller pipes there will be no trouble whatever, as they will all stand over their proper channels, but as the pipes get larger they become more crowded, and it may become necessary to groove some of them off a few inches, so that they may have speaking room. This is especially the case

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AMATEUR WORK, ILLUSTRATED.

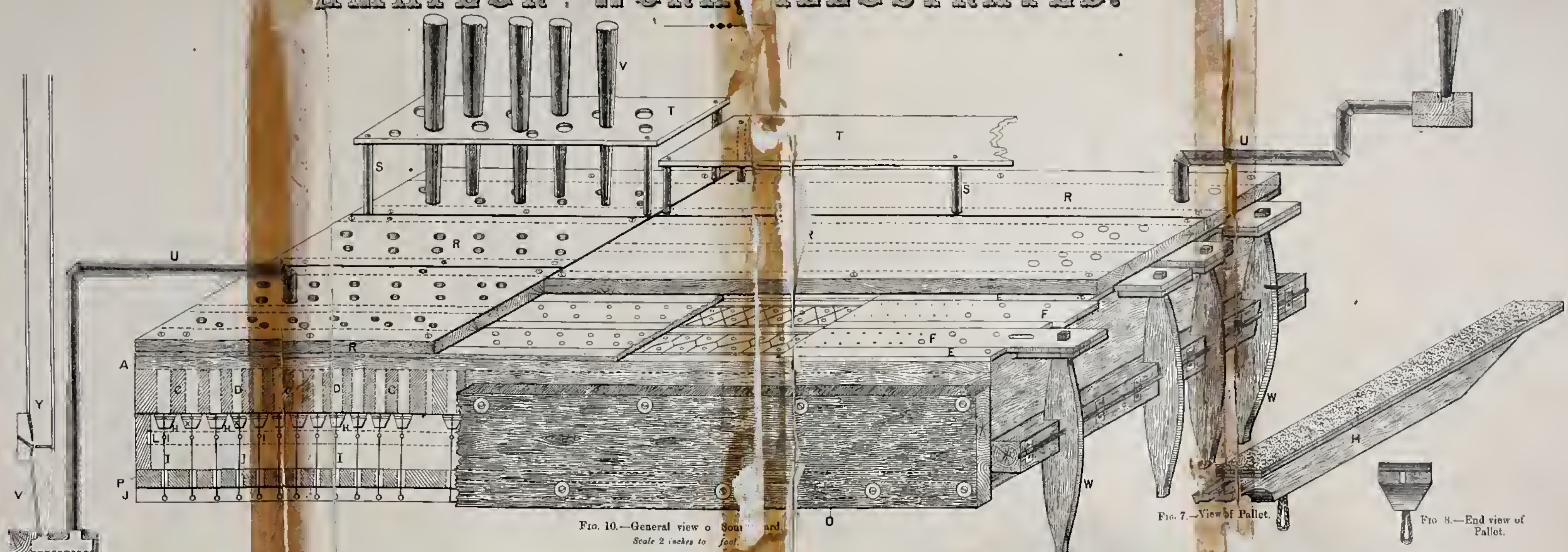


Fig. 10.—General view o Sou ard. *Scale 2 inches to foot.*

Fig. 7.—View of Pallet.

Fig. 8.—End view of Pallet.

Fig. 2.—Section of Sound-board of Single Manual. *Scale 2 inches to a foot.*

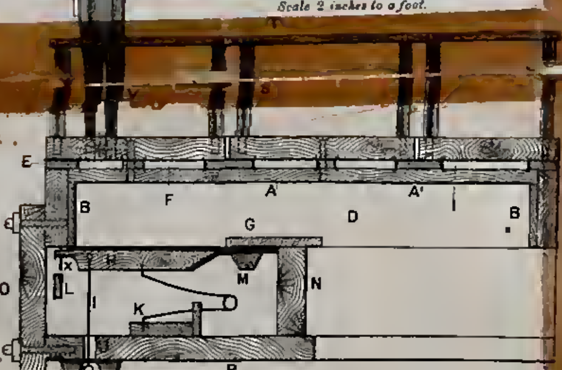


Fig. 3.—Section of Sound-board for a Two Manual.

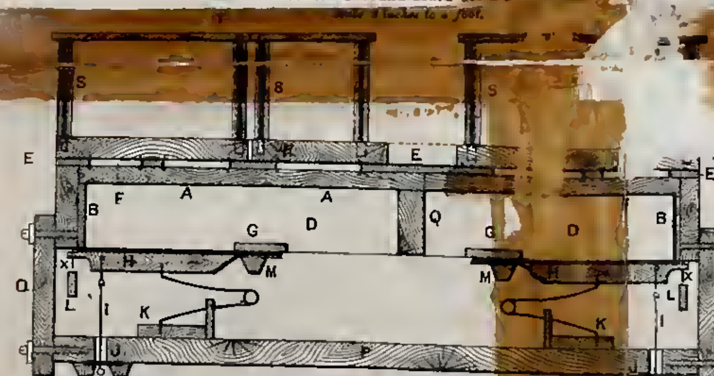


Fig. 4.—Plan of Sound-board Bars, showing filling-in pieces, &c. *Scale 2 inches to a foot.*

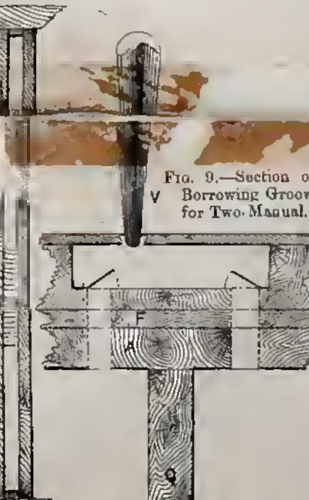


Fig. 9.—Section of Borrowing Groove for Two-Manual.

Fig. 1.—Drawing Board wit plan of Sound-board. *Scale 1½ inches to a foot.*

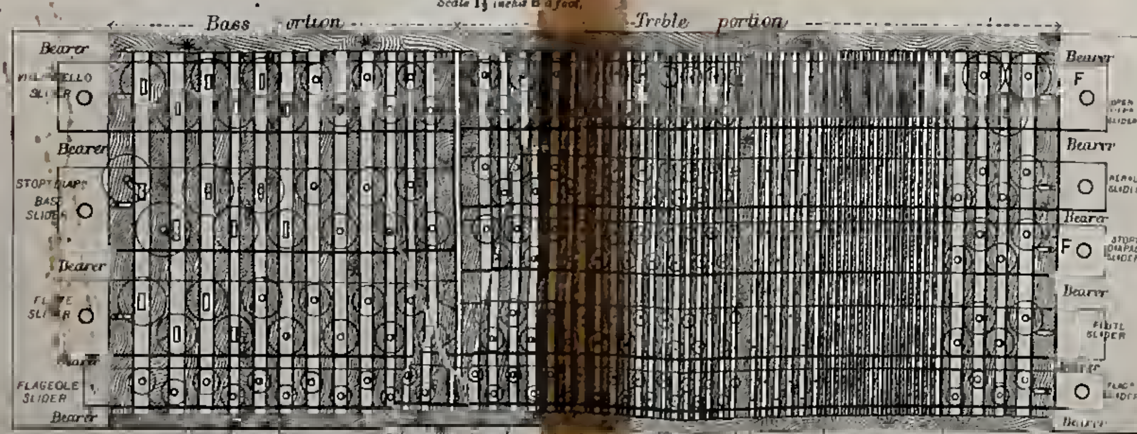


Fig. 5.—Sound-board for Small Organ. *Scale 1 inch to a foot.*

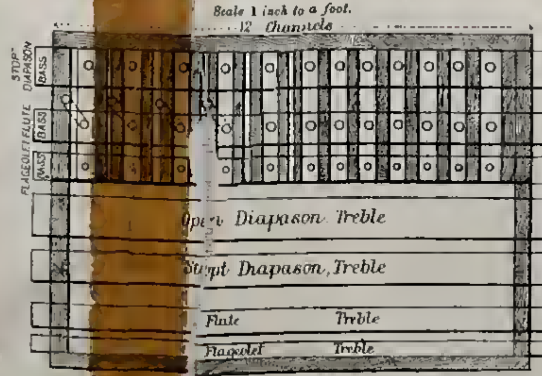
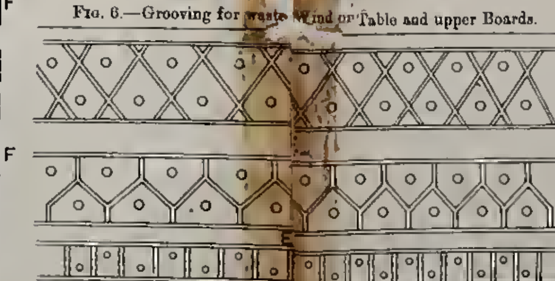


Fig. 6.—Grooving for waste Wind on Table and upper Boards.



ORGAN BUILDING FOR AMATEURS.

DETAILS OF SOUND-BOARD, WIND CHEST, &c. DRAWN BY MARK WICKS.

The Reference Letters refer to the portions in each Figure.

A. Table of Sound-board.
B. Filling in pieces at ends of Channels.
C. Channel Bars.
D. Channels.
E. Bearers.
F. Sliders.
G. Filling in pieces at tail end of Pallets.
H. Pallets.
I. Pull-downs.
J. Brass Plate through which the pull-downs pass.
K. Spring Rail.
L. Thumping Rail.
M. Fillet of wood over Pallet hinge.
N. Back of Wind Chest (Wind Bar).
O. Front of Wind Chest.
P. Bottom Board of Wind Chest.
Q. Division between great and swell Wind Board.
R. Upper Boards.
S. Rack Pillars.
T. Rack Boards.
U. Conveyance Tubes.
V. Pipe Feet.
W. Levers for opening and closing Sliders.
X. Guide Pins for Pallets.
Y. Section of Violoncello Pipe.

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CO. WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

with wood pipes, as they take up more room than paper ones or metal either. It is therefore necessary to set them all out on this board and mark the name of each note, and you will then see where every pipe will stand in the organ. It will only occupy a few hours, and the work will amply repay you in time and trouble that it will save afterwards. To set out the paper pipes all you have to do is to strike a circle with the compasses, the same diameter as the outside measure of the pipes including the tuning piece. Commence with the smallest pipe and work up to the largest and you will then see just how to place them. In the case of wood pipes you will have to cut out a paper pattern of the outside size of the pipes, and laying it on the drawing-board, draw a pencil line round it, and mark the name of the note in the square thus drawn.

We now arrive at the reasons for placing some of the larger pipes at the treble end of the sound-board. The object is to save space, and keep down the height of the organ. The usual method is to transfer each alternate pipe in the bass to the treble end, but the plan I propose possesses several advantages over this. The usual plan is open to several objections, viz., it is the tenor octave that is the most crowded and the most difficult to deal with, not the bass; transferring the bass pipes only does not keep down the height, as the open diapason and the keraulophon both run to 4 feet long in the tenor. It also becomes necessary to waste space by having another very thick bar in the treble, and the sliders require to be made so that one portion is at the bass end, and the other at the treble, thus making a very awkward piece of work. My method avoids all these difficulties, and by transferring the first four or six notes of the tenor octave to the treble end, you are enabled to plant three or four of the longest pipes in the bass of each stop off the sound-board, and three or four of the tenor octave of the open diapason and keraulophon can be planted off at the treble end; thus your longest pipe on the sound-board itself, is only 3 feet 4 inches (approximate) speaking length. You also obviate all crowding of the pipes and simplify the arrangement of the sliders, as the bass sliders, instead of running all through the length of the sound-board, are only the length of the bass portion, and thus, may be made wide enough to accommodate all the pipes, and yet not be too hard to open and close. The Flageolet slider runs right through, and the Flute can be made to draw in two parts or as a single slide. If it is intended to adopt the latter plan, which will save a stop knob and connections, the slider can still be made in two portions and dovetailed together over the thick bars, as shown in Fig. 1. It is shown to draw from the bass end, but could just as easily be drawn from the treble by cutting a little piece out of slider or bearer, just over the thick bar.

If you adopt the plan of planting off the largest pipes, you will require to do so by conducting tubes, as shown in Fig. 10: and as I have made the sound-board of such a size as to obviate as far as possible the necessity for grooving, you will require little, if any, for the wood pipes, and none at all for the paper ones.

Having completed the drawing-board, hang it up in your workshop, so as to be convenient for reference whenever you may require it.

We now proceed to the actual construction of the sound-board, of which the setting-out of the drawing board will have already given you a pretty good idea. First prepare a board of ¾-inch Honduras mahogany, 5 feet long and 1 foot 10 inches wide, finished measurement; plane it perfectly true, and square the sides and ends. If you are unable to get a thoroughly good piece of mahogany, straight grained, free from knots, and well seasoned, use yellow pine of the best quality; for though mahogany is the best, good pine is better than bad mahogany.

Now set off on a rod all the bars and spaces marked on the drawing-board and transfer them to the table, and square them right across the board with a T square, scoring all the divisions as shown in the drawing-board, and from another rod mark the positions of the sliders and bearers.

Prepare the bars and divisions from perfectly sound well seasoned yellow pine, making them of the requisite thickness, and as long as the table is wide, that is, 1 foot 10 inches, and they must all be exactly the same depth, viz., not less than 3 inches. If you cut them from a board 11 inches wide, divide it into three, and after sawing, plane them all up to the size of the one that happens to be the narrowest. Should there be the least knot or shake in any of these bars, throw it aside and prepare another one; for it must be borne in mind that if the wind is allowed to pass from one channel to another it will probably be necessary to pull the sound-board to pieces in order to remedy the defect. The pieces thrown aside will not be wasted, as they can be cut up to form the fillings-in hereafter described, and the knots and bad places need then be the only parts absolutely rejected. When you have prepared all the partitions, etc., take the two 1½-inch bars forming the ends, and having made sure that the edges are planed perfectly level and square, screw them on to the top of the table at each end (not on to the side which you have marked out, which is the underside), the screws being inserted through the centre line of the *bearers*, not through the sliders. Then screw on over their proper positions the thick bars dividing the bass from the treble, and also the thick bar which comes in the centre of the treble portion. These bars are only fixed here

temporarily, in order to keep the table rigid and flat during our next operations, but it is very important that it should be done. Turn the board over again, and go to work on the underside, and groove out all the scored bars to a depth of $\frac{1}{8}$-inch, using either a grooving plane or a chisel. You can cut the groove at each side with a sharp-pointed knife, or a tenon saw, using a straight-edge to guide it, and after taking out the intervening wood, smooth the bottom of the grooves with the tool called an "old woman's tooth," and you will then secure a uniform depth also. Take off the pieces screwed on to the top, groove the places where they are to come on the underside, and then screw them on to the top again. Now plane the bars and divisions so that they just fit nicely into their proper grooves, but not so tightly as to require forcing in, and be sure that they all bed flat down into their places. Give every division a coat of very thin hot glue on both sides to stop all the pores, and set them up to dry. When dry you may proceed to glue them into their respective grooves, working them backwards and forwards a little to secure a good joint. I need hardly say that both the grooves and the edges of the bars should be glued. For all the work connected with the organ use only the best French or Russian glue, which is of a very light colour. Thick black-looking glue, that is sold at about 4d. or 6d. a pound, is useless for any work that is intended to last. The glue should be broken up and soaked in cold water for ten or twelve hours, then placed in a proper glue pot, and boiled down. It should be used fresh, and boiling hot, as glue that has often been remelted, or that has become cool, will not hold well.

After all the other bars have been glued in and allowed to get dry, you can take off the top pieces and glue them into their proper groove; then cut up a lot of pieces of pine for filling-in pieces, and glue in a piece about $\frac{1}{4}$-inch thick between the ends of every bar, so as to entirely fill up each end of the channels, as shown at B in Figs. 2, 3, and 4. At a distance of $7\frac{1}{2}$ inches from the front edge of the table fill in a piece of $\frac{3}{8}$-inch pine to receive the pallet hinges; these pieces may be about 4 inches long. Remember you are working on the underside of the board, and that, therefore, if the bass portion is on your left hand, the front of the board is the edge farthest from you. These fillings-in are shown at G on the diagrams.

While this is drying plane up two pieces of sound pine 1 inch thick, and the total depth of the channels including the thickness of the table, which will make them about $3\frac{3}{4}$ in. or 4 in. wide, and as long as the table. These pieces are for the front and back cheeks, and when glued on as I shall describe, will make the sound-board 2 ft. wide. The glueing of the fillings-in should be allowed at least two days to dry, and then you may plane up both edges of the sound-board perfectly true, and place the cheeks in position so that their top edges are flush with the top of the table, and the bottom edges flush with the edges of the divisions. With a stock and bit drill two holes through the cheeks into the ends of each of the thick bars, to receive a screw 3 or 4 inches long. Take the cheeks off and brush a copious supply of glue over the ends of the bars and fillings-in and also over the cheeks, working the glue well in. Then place the cheeks in position, and work them down into their places the same as you did in glueing in the divisions, insert the long screws and screw them tightly up. When quite dry take these screws out, and in their places drive in a long peg of hard wood well glued, and the cheeks will then hold on as long as the sound-board will last.

Prepare the ends of the wind-chest, making them of 1 inch pine, the exact width of the sound-board, viz., 2 feet, and $4\frac{1}{2}$ inches deep, and then plane up the back of the wind-chest, or wind-bar, as it is termed, making it 4 feet $10\frac{1}{2}$ inches long, $4\frac{1}{2}$ inches deep, and at least $1\frac{1}{4}$ inch thick. In the centre of it cut a hole 12 inches long and 2 inches wide to admit the wind from the bellows, and near each end cut a similar hole, 5 inches long and 2 inches wide, for the pedal wind trunks, if you intend having a separate pedal organ; or these holes may be made one in each end of the wind-chest.

Assuming that all the glueing is thoroughly dry, you may now plane down the whole of the under-surface of the channel bars and cheeks, and be very careful to make it perfectly true, then glue and screw on the ends of the wind-chest so that they come flush with the outside ends of the sound-board, thus leaving half-an inch of the thick end bars on the inside to allow the pallets to bed on them. Tack some thin boards all over the under surface to protect it from injury during our subsequent operations, and then turn the sound-board over so that the top is uppermost. Take the smoothing plane and plane down the table till it is as true and level as the surface of a mirror, and then with your rod set out on it the positions of the sliders and bearers. Plane up some $\frac{3}{8}$ inch mahogany of superfine quality and possessing the straightest possible grain, cut it to the sizes of the several sliders and bearers, and shoot all the edges perfectly true. Screw the bearers down in their places with thin $\frac{5}{8}$ inch screws, sinking the heads of the screws below the surface, but do not place these screws over the thick bars. Place the sliders in position so that they fit tightly between the bearers, then plane up some good 1 inch pine for the upper boards, of which you will require three for the treble side, the one over the flageolet side may run right through the bass, and two short ones for the bass portion. They are made

of such a width that they just come to the centres of the wide bearers, as shown in the sections, Figs. 2 and 3. Plane up some good $\frac{3}{8}$ inch or $\frac{1}{2}$ inch pine for the rack boards, making them exactly the same sizes as the respective upper boards. To avoid confusion I have only shown the rack boards at the back in Fig. 10, but it will be understood that they cover the whole top of the sound-board. Lay these flat on the upper boards and screw them tightly down on to the table, the screws passing through the bearers and table into the several thick bars which are made for that very purpose.

Now mark on the top of the rack board the centre line of every channel right across, then draw lines showing the two rows of pipes over each slider, and where these lines intersect the cross lines will be the centre of each hole for the pipes to stand in. With centre bits of the requisite size bore the holes right through all these boards into the channels. Most amateurs bore a little slanting, so the best way to manage is to bore the holes partly through from one side of the board, and then go round to the other side and finish them, and you will thus neutralize this tendency. The sizes of the holes are of course regulated by the sizes of the pipe feet, and they will be about $\frac{7}{8}$-inch for CC, $\frac{5}{8}$-inch for Tenor C, and $\frac{3}{16}$-inch for top G in the Stopt Diapason. Open Diapason the same size for the same notes. The Flute will be about $\frac{5}{8}$-inch for CC, $\frac{3}{8}$-inch for Tenor C, and $\frac{3}{16}$-inch for top G. Keraulophon the same as the Flute for the same notes. Flageolet CC, $\frac{5}{16}$-inch, Tenor C, $\frac{3}{16}$-inch, top G, $\frac{1}{8}$-inch.

The six lowest notes of the largest pipes should be made by boring two holes side by side, and then taking out the intervening wood, thus forming one oblong hole, as shown on the plan in Fig. 1. A piece of $\frac{1}{4}$-inch mahogany is then glued over each of these holes on the top of the upper board, and a hole is bored through it to receive the foot of the pipe, or for the conveyance tube, as the case may be.

It will be noticed that I have placed an extra slider at the back of the bass in continuation of the Open Diapason. This space being there you may, if you please, place a stop of twelve pipes upon it, as it will give you more power and variety in the bass, which will be very useful, especially if you do not have a 16 foot pedal stop. The stop I recommend is termed the Violoncello, and is made like a Stopt Diapason, with a straight upper lip. It is shown in section on the left-hand side of Fig. 10, and you will observe that there is a diagonal line passing from the level of the top edge of the bottom lip to the outside of the ears; this represents a piece of thin wood, which just fits in between the ears, and is glued in that position. Make these twelve pipes exactly the same size as the Tenor Octave of the Open Diapason, the mouth to be cut up $\frac{1}{3}$ the diameter, and the top of the pipes to be covered with a cap the same as in the Stopt Diapason. The size of the holes through the feet, and of the holes to be bored through the sound-board, will be the same as for the Tenor Octave of the Open Diapason; and the six lower holes to be enlarged as described for the other bass stops. When all the holes have been bored for the pipes, do those for the rack pillars—boring them in any convenient position where they will not interfere with the screws—carrying them about three parts through the upper boards. You may then take off the rack boards and enlarge the holes in them, so that the pipe feet will fit them at the required height; and also enlarge the holes over the screws, so that a screwdriver can be let down to ease or tighten the screws as may be required, in consequence of change of temperature causing the sliders to stick or run loose, as the case may be.

The next proceeding will be to scorch all the holes through the sound-board with a red-hot iron rod, to clear out all roughness. The tops of the holes in the upper boards should also be slightly countersunk, so that the pipe feet may fit in perfectly airtight.

Take off the upper boards, sliders, and bearers, and test the surface of the table to see that it is quite true; if not, make it so. Now look at Fig. 6, and you will notice that three different sorts of grooves are there shown as existing between all the holes. These are the various methods adopted for preventing the accumulation of waste wind between the table and the sliders, or between the sliders and the upper boards, which would otherwise cause a cyphering of the pipes.

You may adopt either or all of these methods, but your first proceeding will be the same for each, viz., to mark on the ends of the table and upper boards the position of each slider, draw the lines along the underside of the upper board, and then make a little channel $\frac{1}{16}$ inch wide, and the same depth along each side, where the edges of the sliders would come, and between every hole run channels crosswise into the long ones. This grooving may be done with a **V** tool, or a chisel, or even with a red-hot wire. All waste wind will be carried off by these little channels, and conducted to the outside of the sound-board. The same thing must be done on the table, under every slider. Now take the block of wood with the cork on it, mentioned in Part XII., and stretch a piece of fine glass paper over the cork, then carefully rub down the burrs raised in making the channels on the table and the underside of the upper bar boards. Fix the sliders and bearers in the proper places by means of a small brad at each end, punching the head of the brad below the surface, and then plane down the slides and bearers perfectly level. Take them off again carefully, and draw out the brads, and cut a slot in each slider, as

shown, over the thick end bar, to allow the proper distance for the movement of them. The bass may be drawn out an inch, and the treble sliders ¾ inch each. Drive a stout wire pin into the end bars through each slot level with the top of the sliders, and that will prevent them being drawn any further, but they may be lifted off when required. A piece of thin mahogany, cross-way of the grain, should now be glued on the under side of each slider where it is to draw, and a square or round hole made through to receive the ends of the levers, which are shown in Fig. 10, but will be described in a subsequent chapter. Give the sliders, the top of the table under them, and the underside of the upper boards over them, a good dressing with the very best blacklead, to make the sliders work smoothly. Cut a strip of thick cartridge paper and glue it smoothly on the top of each bearer, and that will allow just sufficient play for the sliders.

If there is any grooving off of the pipes, that should be the next operation. Suppose you find there is not room for a pipe to stand in its proper hole over the channel, you place it as near to it as you conveniently can, and cut a deep groove in the upper board from the hole to where the pipe stands ; the grooves should be at least an inch wide and made quite smooth. The inside should be coated with thin glue to prevent shakes opening, etc., and then a piece of ¼ inch mahogany should be glued over the top of the groove to close it in, and a hole made in it for the foot of the pipe, where it is intended that it should stand. By this method the wind can be conveyed to any portion of the sound-board where it may be desired to place the pipes ; the only rules to be observed are that the grooves should be large enough to convey plenty of wind, and that there should be no sharp turns, but if the groove is deflected from the straight line, it should be by a curve.

Another kind of grooving is shown in Fig. 9, and is termed a "borrowing groove." This would be required in the small two-manual organ, mentioned at the bottom of page 21 in Chapter I., as the compass of the swell organ only extends down to Tenor C, and the bass of the great organ has to do duty for both the great and the swell. This is a proceeding which has nothing to recommend it, when viewed from a strictly musical standpoint, as it follows that the bass, which should be nearly equal in power to the treble, is really very much weaker ; but the plan is often adopted in small organs to save expense and to keep down the height of the instrument. The Stopt Diapason slider should be placed at the back of the great sound-board, and the upper board should extend over it and also over the slider in the swell organ, as is shown by the dotted line in Fig. 3. A groove is then made in the upper board, connecting each bass channel in the swell with the corresponding channel in the great, and a hole is bored through at each end into the channels just the same as though a pipe stood at each end of the groove. It will thus be understood that, although there are no bass pipes in the swell, the sound-board is made with fifty-six channels exactly corresponding with those of the great sound-board. Over the holes at each end of the grooves a leather valve is placed, which opens upwards into the groove. These valves are made by glueing two thicknesses of soft white sheep-skin together, with the soft side outwards, allowing a single thickness only to form the hinge. Cover the top of the groove with thin mahogany in the usual way, and bore the hole through it to receive the foot of the pipe in any convenient place, so long as it does not come immediately over either of the valves. Now on pressing a key in the bass of the swell organ, the little valve flies open and the air is admitted into the groove and passes out through the pipe. The little valve at the other end keeps closed, and thus prevents the wind passing down into the channel of the great and causing all the pipes to sound for which stops might be drawn. The reverse would be the case on pressing a key on the great organ.

Where grooves cannot be used, tubes are convenient for conveying wind to pipes when they are planted off the sound-board, whether at the sides, back, or front of the organ. These tubes are generally made of metal, and are costly ; but the amateur, profiting by his experience in making paper pipes, can makes these tubes in just the same way, painting them inside and out to preserve them. There should be no sharp angles, but all turns must have a double joint, as shown in Fig. 10, where one pipe is shown at a higher level, and the other at a lower level than the sound-board. The wind is conveyed to all speaking fronts in this way. The conveyance tubes should always be as large as possible, never less than 1 inch internal diameter. The pipes can be stood on a board and the tubes can enter the board at any convenient part. The rack pillars should be 4 or 5 inches long in the bass, and about 3 inches for the treble, and may be made either round or square, the top and bottom portions should fit tightly into their respective holes (which may be made in any convenient position), and should be blackleaded, so as to be easy to remove at any time that may be required.

Having completed the upper portion of the sound-board, turn it over again and take off the thin boards which were bradded on to protect the under side. Shake and blow out all the chips and dust from the channels, and after seeing that the surface is quite true, glue a sheet of stout cartridge paper, allow it to stretch, and then fasten it down over the entire surface of the channel bars, rubbing it well to ensure its

perfect adhesion everywhere. When dry, cut out the paper where the pallets are to come, using a sharp penknife.

The pallets must now be made by jointing up a board of sound yellow pine 4 feet 10 inches long and rather over 8 inches wide, the grain running *across* the board ; plane it perfectly true on one side, and on the other side plane it so that it is $\frac{5}{8}$ inch thick at one end, and only $\frac{3}{8}$ inch at the other. Lay it over the pallet holes, the thick end at the bass, mark the centre of every channel bar on the board, square the lines over, and then saw it up into separate pallets. When jointing it up, see that the joint comes over a bar and not over a channel, and before sawing it, run a rebate $\frac{3}{8}$ inch wide all along the front edge, so as to leave the thin piece on the level side. After separating the pallets plane them to shape, slope off the tail end, and make a cut in the front end with a tenon saw, to a depth of about $\frac{3}{8}$ of inch, as shown in Figs. 7 and 8. At $\frac{3}{4}$ inch from the front bore a small hole right through the pallet, and enlarge it on the upper side, pass a loop of thin whipcord through this and gently drive a glued wedge in between the two ends of the cord to hold it firmly, and then trim it off nice and level with the top of the pallet. The pallets, when finished, should be wide enough to lay at least $\frac{1}{8}$ inch on each channel bar. Now get a piece of strong, but very common, calico that has been washed, and glue the pallets on to it side by side, allowing the calico to project 3 inches at the tail end. Cut them apart when dry, and then glue them on to a strip of stout felt in just the same way, but not allowing any felt to project at the tail. Cut apart again, and then glue them on to a piece of the best sheepskin leather, allowing 3 inches extra for the hinge, the same as with the calico, which should be neatly glued down against the end of the felt and over the leather. Some use two thicknesses of leather instead of felt and leather, and if this is done, both pieces of leather should overhang at the tail end as shown in Fig. 7. The grain surface of the leather must be well roughened with glass paper, or the glue will not hold. When dry, cut the pallets apart with a sharp knife, and then sprinkle some whiting on a sheet of glass paper, and gently rub the soft leather surface of the pallet on it until the whiting is worked into it. The pallets may now be glued in their places on the channel bars. The tail or hinge piece is glued, and the glue allowed to touch about a quarter of an inch of the end of the pallet, and it is then rubbed down on the filling-in piece at the back of the pallet hole. Be careful to get the fronts in a straight line, and then give each pallet a tap with a hammer to bed it on the channel bar so as to make it fit quite air-tight. Now drive a stout pin or wire into the front cheek through the little saw cut in the front of each pallet. This is the guide pin, and it prevents the pallet from shifting sideways, but allows it to move easily downwards. The guide pins may project a little more than an inch from the channel bars. In many organs a guide pin is put on each side of the pallet, but it is obvious that, whilst it does no more than the front pin in preventing lateral movement, it gives two chances of the pallet sticking, through dampness, or from the pins getting bent.

Cut strips of leather 4 or 5 inches long, and glue one over the hinge of each pallet, and carry it right up to the top of the sloping tail of the pallet. We now come to a disputed point in organ building, viz., whether or not a fillet of wood should be screwed tightly down over the leather hinge of the pallet, as shown in the sketches. I have shown it so, that in may be adopted or not, but I myself prefer its absence to its presence.

The springs of the pallets are made of No. 18 or 19 steel wire, as shown in the sketch, and the method is as follows : Drive two pieces of stout wire into a board about 5 inches apart, and forming the apex of an equilateral triangle with the wires, insert a peg of hard wood about $\frac{3}{4}$ inch in diameter. Now take a piece of spring wire, place it against the first wire peg, then carry it up to the wood peg, and twist it twice round and continue the wire down to the next wire peg, and bend it against it. Cut it off with the nippers at this point and slip the spring off, and make both the arms of it curve a little inwards, and it is finished. Make all your springs on the same pegs and they will all be alike. Now make a slip of wood rather longer than the length of the interior of the wind-chest, 3 inches wide and about $\frac{1}{2}$ inch thick, on the back edge of this glue a slip of $\frac{1}{4}$ inch mahogany $1\frac{1}{2}$ inch wide, and immediately under the centre line of each of the pallets make a tenon saw cut $\frac{3}{4}$ inch deep in this mahogany slip. Place the springs in these saw cuts, and bore a little hole in the pallet $4\frac{3}{8}$ inch from the front edge, and a similar hole in the pine slip, and insert the ends of the springs in the holes. The spring rail may now be fastened in its place by screws or buttons. The thumping rail is made of a slip of wood $\frac{3}{4}$ inch thick, and $1\frac{1}{4}$ inch deep. It is nearly as long as the sound-board, and is let into a groove in each end of the wind-chest, at about one inch below the fronts of the pallets, so that it prevents them being pulled down more than an inch. It should be covered with leather or cloth on the top edge, and should be fastened in position by a button or screw, so as to be easily taken out, if required, to get at the pallets.

Now dovetail the back of the wind-chest into the ends, so as to make a good joint of it, and screw it down tightly on to the edges of the channel bars, but do not glue it to them. In order to make it air-tight,

you may glue a piece of paper all over the joint at the back.

Now get some tinned iron wire (No. 19 gauge) and cut 56 pieces, and make a neat little hook at one end of each piece with a pair of round-nosed pliers, so that it will hook on to the whipcord loop of the pallet and hang down rather more than an inch below the underside of the bottom board of the wind-chest. This bottom board is merely a piece of $\frac{7}{8}$ inch pine, the size of the wind-chest, to which it should be tightly screwed when in position. Immediately under each of the loops bore a hole in the bottom board fully $\frac{1}{4}$ inch in diameter, for the pull down wires to pass through. Now procure a strip of stout sheet brass 5 feet long and $1\frac{1}{2}$ inch wide, and drill a very small hole in it over the centre of each of the holes in the bottom board. Enlarge these holes with a fine rymer, very carefully, so as to make them just large enough for the pull-down wires to pass through without any wind escaping round them. This plate of brass is now fastened down on to the bottom of the wind-chest by a fillet of wood being screwed on each side of it, as shown at J, in Figs. 2 and 3. Then unhook all the pull-downs, and make a little loop at the bottom end where it hangs below the brass plate.

It now only remains to make the front of the wind-chest, which is merely a $\frac{3}{4}$ board of pine or mahogany. See that the front edges of the wind-chest are quite level all round with the front cheek of the sound-board, and then glue a strip of soft leather all round where the front will come on. Screw the front on with long, thin round-headed screws, with brass washers or shields, to prevent the heads drawing into the wood, and be sure that no air escapes round the joints.

The method I have described for making the sound-board, is the one I adopt myself and recommend, but some builders merely glue the edges of the bars on to the table without grooving them in. This plan, however, is not so strong, and increases the danger of leakage from one channel to another, especially in sound-boards of amateur construction, and as it takes longer in glueing, it does not really save much time. Another method is to put the sides and ends together first, and then groove the bars into the slides, putting the table on last. This, however, requires extreme accuracy in planing, but if a good board cannot be procured, the table is formed by glueing slips of $\frac{3}{4}$ inch pine in between each channel bar, and thus forming a solid top.

The 2-manual sound-board may be made in two distinct boards, and then glued together, or may be made all in one, and divided by filling in pieces, as shown in Fig. 3. One wind-chest will supply both sound-boards, as it extends under the whole surface of them. The great pallets open at the front, and the swell pallets at the back. The holes for the wind-trunks must be made in the ends of the wind-chest. The general instructions for making the single manual will apply to the 2-manual.

For a small organ, containing from 1 to not more than 4 stops, a very compact arrangement is to make the sound-board double as shown in Fig. 5. The front portion contains 44 channels, thus taking all the pipes down to Tenor C. The back portion has only 12 channels for the 12 bass pipes in each stop, and the pipes will thus stand in a single row over each bass slider. The divisions should be made double in the bass sound-board, in order that the channels may not be too large, about $1\frac{1}{4}$ inch being wide enough for the largest channel, and $\frac{7}{8}$ inch for the smallest. The width of the slider for the Flute bass and also the width of the bass portion of the sound-board may be considerably reduced by grooving off the Flute pipes so that they stand opposite the space between each of the Stopt Diapason pipes, as indicated in Fig. 5, and it would only involve 2 or 3 inches of grooving for each of these 12 pipes. The length of the sound-boards may be from 3 feet 3 inches to 3 feet 9 inches, or longer if you like, as the more room there is, the better the pipes will sound. The bass pallets will open at the back and the treble ones at the front, and the wind-chest will extend under the two sound-boards in exactly the same way as is shown in the section of the 2-manual in Fig. 3. The action will be described in due course. For a 1-stop organ, the treble and bass sound-boards should be each about 5 in. in width (clear length of channels), the channels being 2 in. deep. The dimensions already given for widths of bearers and sliders, depths of channels, etc., will apply to any organ having more than one stop.

In the next chapter I will describe the construction of the bellows.

(*To be continued*) 221

VELOCIPEDES:

THEIR CONSTRUCTION AND USE.

By A. STEPHENSON.

IV.—CUTTING SPOKES—PUTTING THE WHEELS TOGETHER—PUTTING ON TYRE—BEARINGS.

IN our last paper was described the building of a wheel up to the finding of the length of the spokes. An examination of the diagram, Fig. 1, will show how to find the exact length to cut the spokes before screwing. In Fig. 1 the horizontal line A B is first drawn, on it is raised the vertical line C D. Now the

exact diameter of the crescent rim has to be found. If the rim is perfectly circular, this may be readily done by passing a straight wire through the two opposite spoke holes, right across the centre of the wheel, and marking the wire at both ends flush with the bottom of the hollow in the rim; or, in other words, just where the head of the spokes will be. Assuming the marked wire to measure 47 ins., half this length, 23½ ins., is laid off from C towards D on the vertical line, say to G, where a section of the rim is shown in Fig. 1.

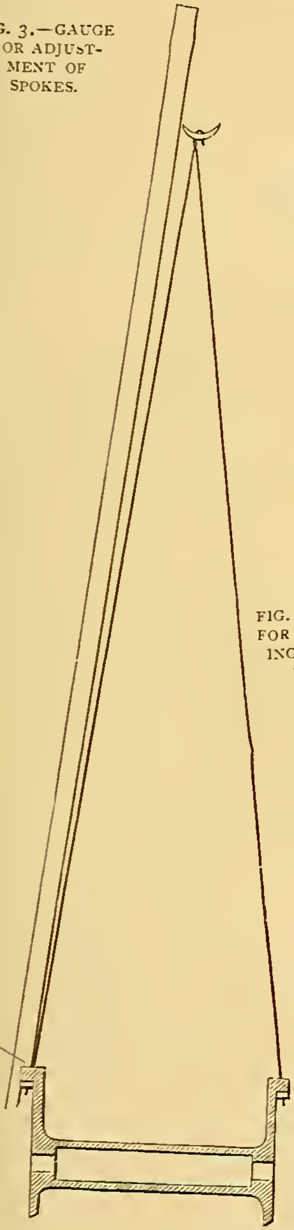


FIG. 3.—GAUGE FOR ADJUSTMENT OF SPOKES.

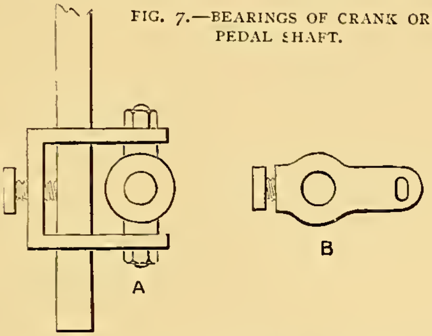


FIG. 7.—BEARINGS OF CRANK OR PEDAL SHAFT.

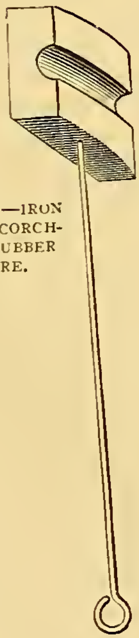


FIG. 4.—IRON FOR SCORCHING RUBBER TYRE.

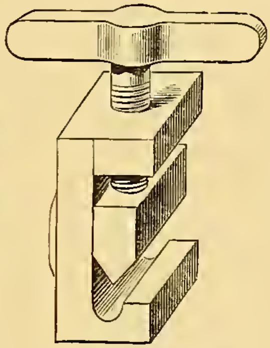


FIG. 2.—SPOKE TIGHTENER OR ADJUSTER. FULL SIZE.

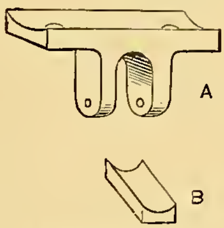


FIG. 5.—BEARING OF MAIN AXLE ON LEFT.

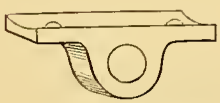


FIG. 6.—BEARING OF MAIN AXLE ON RIGHT.

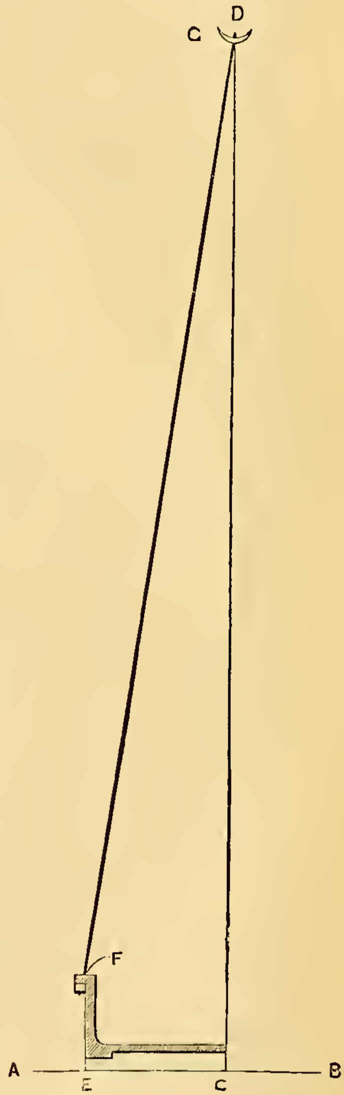


FIG. 1.—DIAGRAM SHOWING HOW TO FIND EXACT LENGTH TO CUT SPOKES BEFORE SCREWING.

Now taking the hub to be 6 inches in length, measuring from centre to centre of the spoke holes in both flanges, half this distance (3 inches) is set off from C to E, on the horizontal line; then assuming the flanges to be 4 inches in diameter, on a vertical line drawn from the point E, half that diameter (namely 2 inches) is set off to F. A line drawn from G to F gives the length of the spoke less $\frac{5}{8}$ inch. This additional $\frac{5}{8}$ inch passes through the rim of the flange and into the nut beneath, half an inch of the spoke being screwed for

that purpose. The unscrewed part of the spoke will thus enter the hub to the depth of $\frac{1}{8}$ inch, thus concealing the screwed part, and making a neater, as well as a much stronger job.

The hub, rim, and spokes being now ready, the wheel has to be put together. A small instrument, called a spoke-tightener or adjuster, is now necessary ; this instrument is shown at Fig. 2, full size, and may be bought for 2s. 6d.

Now, as I have never seen a maker building a wheel, or indeed building any part of the machine, I am left entirely to my own devices ; and the means generally attaining the end, I am led to infer that amateurs left to their own devices and resources need not despair of success.

I proceeded then with the building of my wheels as follows : Placing the rim on the bench with three or four blocks of wood some 3 inches thick under it, and standing the hub on end in the centre, I entered the spokes first through the rim into the hub, giving them a few turns by hand into the little nuts behind the flange rim. All the spokes on one side the wheel being entered in this way, the wheel is turned over, and the other side treated in the same manner. Now the spoke-adjuster comes into requisition. It takes firm hold of the spokes, and they may be readily turned to almost any degree of tightness. With this instrument all the spokes may be screwed till they appear through the nuts, then a gauge has to be made. I used a rod of wood with a part cut away as in Fig. 3. The narrowed part rests upon the hub, and the shoulders comes against the edge of the flange. In the final adjustment of the spokes, this rod is placed close alongside each, and a mark made on it at the edge of the crescent rim, as shown in Fig. 3. If all the spokes are screwed up to show this mark at the edge of the rim, and that on both sides of the wheel, then the wheel may be taken as correctly trained ; and the hub will be found to project equally on either side the rim.

It is to be observed tbat while the spokes must be tight, and all of them equally so, they must not be too tight, for it is quite possible to make them so tight as to buckle or twist the wheel in figure 8 fashion ; when this tendency shows itself, the spokes must be slackened, when the rim will be found to come right again.

Our three wheels constructed, we have now to fix on the rubber tyres. The tyres are bought of a size, both in diameter and section, to fit the rims, $\frac{7}{8}$ inch for the large wheel, and $\frac{3}{4}$ inch for the small wheels. Cement is also bought with them. To prepare the rims for the cement, the spoke-heads have to be filed down nearly flush, taking care not to file away so much of the head as to allow the spoke to draw through the rim. The rim is well cleaned with paraffin, dried with a cloth, and heated at the fire.

Then the rubber requires some preparation to make it adhere the better to the rims ; it should be seared or scorched on the surface with a hot iron, on the side that is embedded in the rim. To do this scorching I contrived an instrument which serves two purposes. It is a piece of cast iron having an iron handle, and formed as shown in Fig. 4, it is $2\frac{1}{2}$ inches long in the direction of the groove. The groove, or hollow, is a semicircle 1 inch wide, and curved in its length to fit the inside of wheel rim ; I use two of these heaters, so that while one is being used the other is being heated. To scorch the rubber it is moved along the hollow in the heater rather smartly, so as not to burn it. This removes the floury dust which is characteristic of new rubbers, and gives the surface a sticky feel and a better adhering surface.

The cement is put into a stone jar or a tin can, and dissolved over the fire ; when of the consistency of treacle or stiff glue, it is applied in the hollow of the rim all round, with a stick or a brush, to a thickness of $\frac{1}{16}$ inch, and that up to the edges of the crescent, then the rubber is placed carefully on with the seared side towards the cement. Now the two heaters come into requisition.

I understand the rims are often heated with a gas jet, and the rubber pressed in with the hand. I found this to be tedious, and, besides, a nasty job for the hands, from the sticky nature of the cement. I made a block of wood 8 inches long, hollowed in its length to the circumference of the wheel, and along the centre I made a semicircular hollow to fit the rubber. Standing the wheel on edge on this block, I put an iron rod through the hub, fixed one end in a post, and loaded the other with a 28lb. weight, thus pressing the rubber into the hollow block ; then applying the heaters between the spokes on the rim, the cement immediately began to run and ooze out at the edges. This operation being continued all round the wheel, the rubber may be considered to be a fixture (until it comes off). This method of fixing may be carried through without the hands coming in contact with the cement in any way, and it makes a very satisfactory job. The superfluous cement has got to be carefully cleaned off ; and the wheels now completed, we will devote our attention to the other parts of the machine.

One very important factor in the construction of a tricycle is the bearings. The bearings have to carry the weight of the frame as well as that of the rider, and the easier the axles revolve in the bearings, the easier will the machine be propelled along. There are three kinds of bearings that may be noticed—named respectively, plain, roller, and ball-bearings.

Plain bearings are simply cylinders of steel or gun-metal, fitting neatly on to the axles. When properly made and fitted, they run about as easy as any, but they

must be kept clean and constantly oiled, and that with an oil that will not clog.

In roller bearings, a series of small rollers are enclosed in a case; the rollers come in contact with the shaft or axle, and revolve along with it, but in the opposite direction, the aim being to lessen the friction, thereby making the machine easier to drive. Both these forms of bearings have largely given place to ball bearings.

Ball bearings are composed of small steel balls enclosed in cases prepared with grooves to receive them; these cases usually encircle collars or rings on the axle, said collars have also grooves to fit the balls. On the shaft being set in motion, these balls revolve in the grooves, thereby greatly lessening the friction.

Besides the reduction of friction with the use of ball bearings, a greater advantage is that they require but little oil, one oiling serving for a long journey, and being generally very nicely fitted, the oil does not ooze out and get on to the dress of the rider, as it often does with the use of plain bearings. The ball bearing cases may contain one or more rows of balls, and are known as single or double ball bearing; in either case, they are a luxury that cannot always be reached by amateurs, and in the case of the machine at present under consideration, only plain home-made bearings are used, which, if well made and well kept afterwards, are very little inferior to the best, and when a little worn can be replaced at very small cost.

In our machine all the bearings are of hard or bush brass. The main axle has two bearings, that on the left is fixed under the tube frame, between the chain wheel and brake drum. It is a forked bearing, as shown in Fig. 5 at A, is made thus to allow of the axle being readily removed from the frame by the withdrawal of one bolt. The whole load is on the upper side of this bearing. The piece, Fig. 5, B, is slipped in between the jaws of A, after it is on the axle, and a $\frac{3}{8}$ inch bolt is passed through the jaws of A, underneath the piece B; this prevents the frame lifting from the axle when pulling at the handles or using the brake. This bearing is hollowed on the upper side to fit the tube, and is bolted thereto with $\frac{3}{8}$ inch bolts, a piece of rubber $\frac{1}{4}$ inch thick is inserted between the bearing and the tube, the bolts passing through it also keep it in place. The bolts are not screwed very tight, so that the bearing is free to find a proper bearing on the axle all through. The bearing on the right or open end of the shaft is shown in Fig. 6. At this end of the shaft the weight on the axle is downwards, the bearing is therefore made solid with a hole the diameter of the axle drilled through it. It is bolted to the under side of the long tube with rubber between, as the other.

We have now to consider the bearings of the crank pedal shaft, these are shown Fig. 7, A, B. This bearing consists of a bracket fitted to move up or down on the rod depending from the frame for that purpose. This bracket carries a ball, or sphere of hard brass, bored through to admit the shaft ends, the balls are made with a short projection, top and bottom, and the projections are bored and tapped for the studs which are not screwed quite home, so the ball is free to revolve on them. Then to allow the balls a little play the other way, the holes in the jaws of the bracket are somewhat elongated, as shown in Fig. 7, B; by this arrangement the axle always finds a proper bearing in the balls, even though not carefully adjusted parallel with the main shaft. The brackets are adjusted and held in place on the depending rods by studs or set screws at the back. The balls are pierced for oiling, and small lubricators screwed in. To remove the cranked shaft, one of the back studs is turned back a quarter of a turn, the bracket swivelled round on the rod, and the shaft drops out. This is very handy for cleaning the shaft ends and bearings, which should be done frequently; the shaft may be replaced with equal facility and adjusted inside of two minutes.

Another object in view in the invention of this bearing is that for more direct or vertical pedal action. The brackets are turned round, placing the balls at the back instead of the front of the depending rods, thereby bringing the pedals some 3 inches further back under the rider. I have found the bearing to answer admirably in every way, and if fitted with balls inside as a ball bearing, I do not think a better could be wished for.

Our next paper will begin with a description of the small wheel bearings, forks, and the steering centres at ends of long tube.

(To be continued.)

WOOD-CARVING FOR AMATEURS.

By LEO PARSEY.

IV.—HOW TO CARVE IN WOOD.

I HAVE already explained in previous papers the various tools and appliances required by the wood-carver, and shall now proceed without further delay to give directions for the actual process of carving in wood. It will easily be understood that it is almost impossible to give written instructions on every detail of the wood-carver's art, and I shall therefore give general directions only, as to the treatment of the designs, leaving the treatment of small

details, such as the number of petals in a rose, or the curl or twist to be given to a leaf, for instance, to the individual taste and skill of the amateur.

The grand secret of success in wood-carving, is to obtain a complete command over the tools, so as to make them obey the will of the operator, irrespective of difficulties in the shape of the grain of the wood, etc. To obtain this mastery over the tools, practice is the only remedy, and no matter how simple the design may be, it will be found that continued practice is the only thing to accustom oneself to the use of the tools.

The proper way to hold a carving-tool, is to grasp it firmly with the left hand, so that the lower part of the hand comes to within an inch of the edge of the tool, and acts as a guide to it, the right hand grasping the tool by the top of the handle, acts, so to speak, as the motive power.

It will be found that with this method of holding the tool, more power can be exercised, and at the same time there will be less chance of those unlucky slips of the tool, which so frequently mar the effect of a piece of work. There are various methods adopted in carving; some workmen will only slightly "block out" the design in the wood, and leave the greater part of the work to be done in the finishing. Of course every piece of wood intended to be carved, is subjected to at least two processes, viz., the roughing, or blocking out, and the finishing pro-

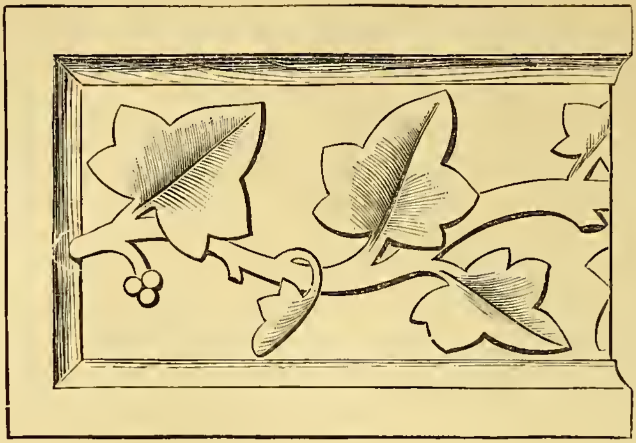


FIG. 22.—PORTION OF PANEL TO THE LEFT, SHOWING DESIGN WHEN BLOCKED OUT.

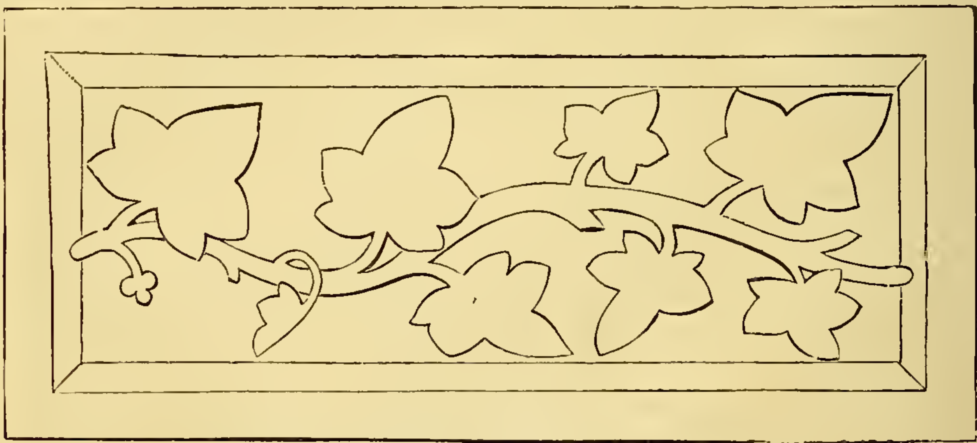


FIG. 21.—DESIGN AS DRAWN ON THE SURFACE OF THE PANEL IN OUTLINE ONLY, BEFORE CARVING.

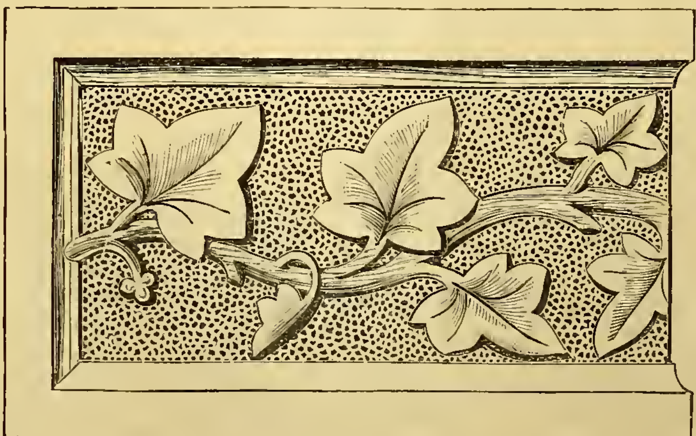


FIG. 23.—PORTION OF PANEL TO LEFT WHEN COMPLETED.

cess. The first thing then to be done, after the design has been carefully marked, or traced on the wood to be carved, is to cut away all waste or superfluous wood, such as sinking the groundwork of a panel, for instance. When this is done, the outlines and shapes of the leaves, etc., of the design should be roughly shown, and after the design has been thus blocked out, it is advisable to thoroughly sharpen the tools required, and then to carefully finish off every detail. I have, in Fig. 21, given a simple design of ivy leaves, which may easily be utilized as a panel, and in Fig. 24, I have given a conventional design of sunflowers and leaves. These designs, however, are reduced in size, as my space here is limited, but they can easily be enlarged by the amateur, to either twice or three times the size. We will suppose that the piece of wood intended for the panel has been smoothly planed and squared, and is either stave-oak or walnut-wood, not exceeding $\frac{1}{2}$ an inch in thickness, and that the design has been drawn on the wood, as in Fig. 21. The work should

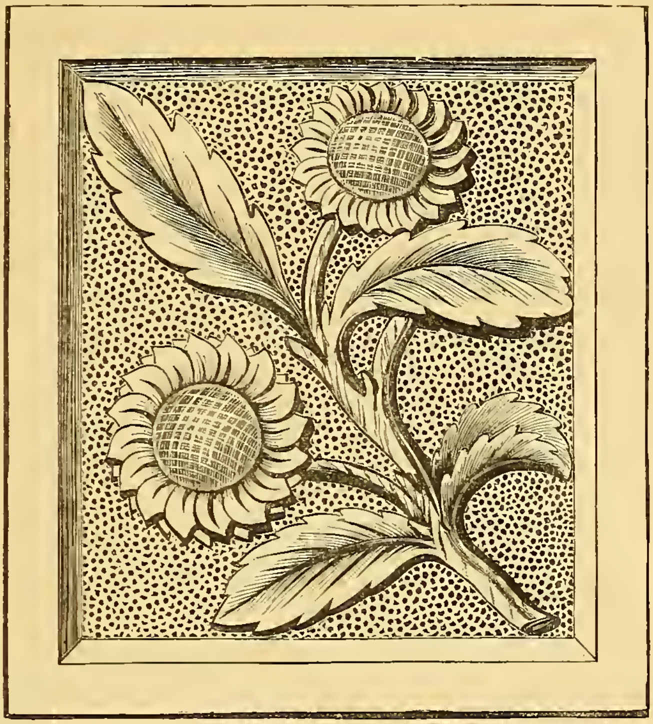


FIG. 24.—PANEL, SUNFLOWER, CONVENTIONALLY TREATED.

FIG. 26.—GROTESQUE DESIGN FOR HALF-CRUTCH WALKING-STICK.

FIG. 25.—GROTESQUE DESIGN FOR KNOB OF STICK.

now be fastened firmly to the bench, either by means of the wood-carver's screw (described in Vol. I., page 277) or a thin piece of deal can be screwed on to the back of the panel, and then a couple of screws can be put through the ends of the piece of deal, which should project an inch at each end of the panel, and screwed to the bench. The wood-carver's screw, however, will be found the most convenient. First of all, take a parting tool, and work it round the *outside* of the outlines of the leaves and stems, and *inside* of the panel mouldings, and then with tools of the proper shape, and the mallet set in the lines made with the parting tool. Cut away all the shaded portions of the design (Fig. 21) with hollow tools. The ground-work of the design should be about $\frac{1}{4}$ or $\frac{3}{8}$ of an inch deep, and when this depth is reached, the "router" will be found a most convenient instrument for regulating the depth. The cutter of the "router" should be set to the depth required, and then by pressing it firmly, and working it sharply backwards and forwards, a level ground will be obtained.

In setting down the outlines of the leaves, etc., it will be better to cut outside the lines, and care should be taken to cut down perpendicularly; otherwise, if the leaves are undercut, the shape will be spoiled when they come to be finished. Bent flat tools are used for clearing away the wood when making the groundwork, and for clearing out the wood that cannot be got at with the "router."

When the groundwork has been so far finished, a commencement should be made in forming the moulding and roughly shaping and giving the required turns to the leaves and stem, but no finishing touches should be put in until the whole design has been gone over in this manner. It is better in doing this to use hollow tools only, leaving the flat tools to finish off the work with. Of course, in setting in the outlines, the tools that are of the proper sweep to fit the lines should be used.

When all the design has been carefully gone over, as above described, there remains only the last process to go through, and we begin this by first of all carefully finishing the moulding, which in this case is simply a flat hollow, and then proceed to carefully finish off the leaves and stem, and rectify any little irregularities of the groundwork. In doing this we shall find the advantage of the frequent use of a hard brush, to brush out the small chips. When this is done, we commence to use a punch for the groundwork until it has all been gone over, and then the veins of the leaves require to be put in with a veiner, and the stems require to be roughed, so as to give a natural appearance to the work. The various tools have been previously described, and it will be found that about eighteen will be necessary to work this design. When the work is finished, it can either be brushed over with boiled linseed oil, or it can be left plain, at the taste of the carver, but glass-paper should on no account be used. Fig. 24 shows the design when "blocked out," and Fig. 23 shows it in its finished state.

It will be an easy matter, in this design, for the amateur to obtain a spray of the natural ivy, and refer to it for the shape and twist of the leaves, etc. In Fig. 24 it will be observed that the shape of the sunflower, and the treatment of it is decidedly conventional, and in like manner the leaves may be treated so as to give the best effect.

The method of working to be adopted with this, is exactly the same as the method I have described for the panel. In carving fret-work picture-frames or brackets, the same treatment is to be used, but in finishing off it will be in many cases advisable to champfer the edges of the leaves, etc., from the back, so as to take away the appearance of heaviness, which invariably results when the thick edges of leaves, etc., are left.

I noticed in AMATEUR WORK for October, an interesting article on walking-sticks; and in case any of the readers of this article may feel inclined to make walking-sticks for themselves, I have given two grotesque designs, which may be carved on the head of either walking-sticks or umbrellas. Fig. 25 is a suitable design for an ordinary knob, and Fig. 26 will suit a half-crutch admirably. If the reader does not care to go to the trouble of preparing a stick, he can easily buy one that will suit his purpose at a cheap rate. In carving heads, etc., on sticks, it is always better to rely entirely on the grotesque to furnish designs; and it will be an agreeable surprise to the amateur, to find how easily these grotesque heads can be cut on a stick.

The principal thing to avoid, is, all sharp points, which are liable either to hurt the hand or tear the glove; and the design should in every case be adapted to the size and shape of the knob. In carving these heads, a vice is required to hold the stick firmly, and then the same process is gone through, as with all other descriptions of carvings; first of all, draw roughly the design on the nob, then block out, and finally finish off the work, adding any fancy touches that may be deemed advisable to give effect to the design. It is a frequent practice with carvers, to roughly model the design in clay before commencing to carve it in the wood, or if clay is not at hand, to chop in roughly the design in a soft piece of deal, so as to see the effect the design will really have in the wood when worked out.

In finishing off the work, outlines frequently have to be rectified, and alterations made, that are not

noticed as being defective when the work is blocked out. When setting in the outlines of a panel, for instance, it is better to avoid cutting too deeply, otherwise, the groundwork presents a surface defaced with tool-marks after the outlines have been corrected, and it is not always easy to efface these marks, even when the ground is punched. In shaping a design, however, it is a good plan to use the tools boldly, and cut clean ; instead of which, many beginners will make a dozen cuts where one would suffice.

Before finishing this series of papers on wood-carving, I will give designs and instructions for delicate carving in ebony, and will also give directions and designs for the fashionable incised work.

(*To be continued.*)

FILTERS:

THEIR CONSTRUCTION AND MAINTENANCE.

By ALFRED W. SOWARD.

V.—PATENT FILTERS—THE PREPARATION OF PURE WATER—THE TESTING OF WATER.

Patent Filters.

In previous articles I have described several filters capable of being made by the amateur mechanic. I have now to say a few words about some of the best of those more complex arrangements which, although in most cases beyond the power of the amateur to make, and being moreover patented articles, should yet, on account of their worth, and because they are so frequently met with in household use, be known to him in detail. The filters which I have selected for description are three—the Spongy Iron Filter, the Silicated Carbon Filter, and Maignen's Patent "Filtre Rapide." The first two I have chosen on account of the wide favour which is accorded them ; the last, because of its ingenuity of construction, and economy and rapidity in use.

1. *The Spongy Iron Filter.*—This filter, shown in section in one of its forms in Fig. 25, consists of a suitable vessel having several compartments. One of these, A, contains metallic iron, in what is known as the "spongy" state. Another portion of the same compartment, B, contains a substance, called by the makers, "prepared sand," which is a mixture of fine gravel and a mineral known as pyrolusite (bin-oxide of manganese). Other compartments, C and D, are for the unfiltered and filtered water respectively. Spongy iron is reputed to be one of the best filtering mediums in use, but it has the (very trivial) disadvantage of dissolving to a slight extent in the water submitted to its action. To counteract this, the water, after leaving the iron, is caused to pass through the prepared sand, the pyrolusite of which removes any trace of dissolved iron.

Eminent authorities speak very highly of this filter. Not to multiply instances, the following may be quoted from the "Army Medical Report for the year 1877 :" "The action of spongy iron is slow but complete ; about twenty-two minutes is the time of exposure, and this is usually sufficient to purify all but very impure waters. The water filtered shows no tendency to favour the growth of low forms of life, and may be stored with impunity ; water may also be left in contact with the medium for an indefinite period without undergoing any deterioration."

This filter, invented by Professor Gustav Bischof, of the Andersonian University, Glasgow, is made by the "Spongy Iron Domestic Filter Company," of 505, *Oxford Street*, *London*, *W.C.* The price of the filter shown in the figure is 19s. complete, or the inner vessel only (for filtering into a jug) may be bought for 9s. 6d. It is obvious that, save for the restrictions imposed by the Patent Laws, a domestic filter might be made by the amateur, of a flower pot supplied, in place of charcoal, with spongy iron and a substratum of pyrolusite. A supply of the spongy iron and prepared sand may be purchased separately at the Company's depôt, "for re-charging," at the cost of 2s.

2. *The Silicated Carbon Filter.*—This is one of the best known of the "block" charcoal filters. Fig. 26 shows a common form of it. The "Army Medical Report," before quoted, says of filters employing carbon in porous blocks, that, "These are powerful filters at first, but they are apt to clog, and require frequent scraping, especially with impure waters. Water filtered through them and stored, shows signs of the formation of low forms of life, but in a less degree than with the loose charcoal. After a time the purifying power becomes diminished in a marked degree, and water left in contact with the filtering medium is apt to take up impurity again, though perhaps in a less degree than is the case with the loose charcoal."

These filters are made by the "Silicated Carbon Filter Company," of *Battersea*, *London*, *S.E.* The price of the one figured is 5s.

3. *Maignen's Patent "Filtre Rapide."*—This little known but excellent filter has only quite recently been brought to my notice. It is essentially a carbon filter, and employs as the filtering medium a substance, termed by the makers, "Maignen's patent carbo-calcis." This carbo-calcis is used in the state of fine powder, it being (to quote the *Lancet*) a "now well-ascertained fact that a thin filtering bed of fine material is more efficacious than a thick one of coarse material." The makers state that a coating of $\frac{1}{10}$ inch

of this substance has upwards of 50 square inches of actual effective surface to every square inch of superficial area.

The component parts of the filter are shown in Figs. 27 to 31, and the filter complete (in section) in Fig. 32. Fig. 27, and A, Fig. 32, is the outside case, which also acts as the reservoir for the filtered water. Fig. 28, and B, Fig. 32, is an inner case which serves to hold the filtering materials, as also the unfiltered water. Fig. 29, and C, Fig. 32, is a "filtering frame," designed to offer a large area of filtering surface to the water. Fig. 30, and D, Fig. 32, is a "filtering cloth," woven out of pure asbestos, a mineral substance which, being uninjured by exposure to intense heat, is well adapted for use for a purpose which necessitates purification by fire. This filtering cloth is placed over the frame C, and tied in position with cord prepared from pure asbestos. Over this cloth is spread a thin layer of the filtering medium—the "carbo-calcis"—before referred to. Fig. 31, and E, Fig. 32, is a screen, the object of which is to break the fall of the water coming from above, and so prevent the filtering medium from being washed off the cloth.

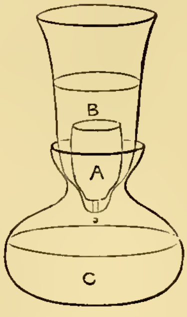


FIG. 26.—SILICATED CARBON FILTER.
A, Porous Blocks; B, Unfiltered Water; C, Filtered Water.

This filter is made at the Asbestos Works, 118, *Southwark Street*, *London*, *S.E.* The price of a small one, filtering a gallon per hour, is 15s. The carbo-calcis costs 1s. per lb., and asbestos cloth 15s. to 21s. per yard.

Preparation of Pure Water.

In my first article I promised to give directions for the preparation of pure water, but the remarks of Mr. Edwinson, at page 100 of the first volume of Amateur Work, Illustrated, render it unnecessary for me to redeem my promise. I, therefore, pass to the concluding subject I have to treat of.

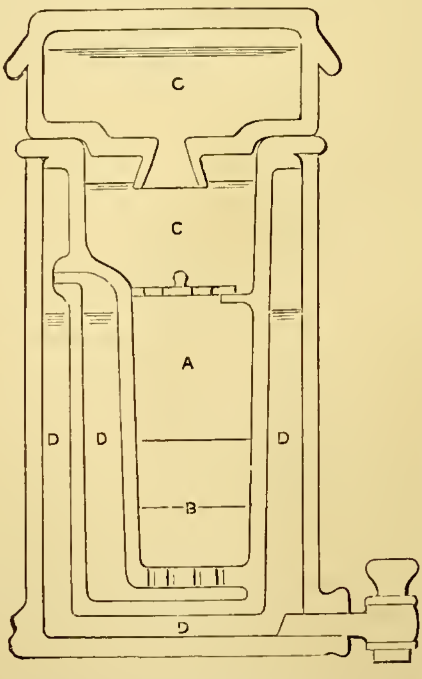


FIG. 25.—SPONGY IRON "COTTAGE" FILTER.
A, Spongy Iron; B, Prepared Sand, Fine Gravel, and Pyrolusite; C, Unfiltered Water; D, Filtered Water.

The Testing of Water.

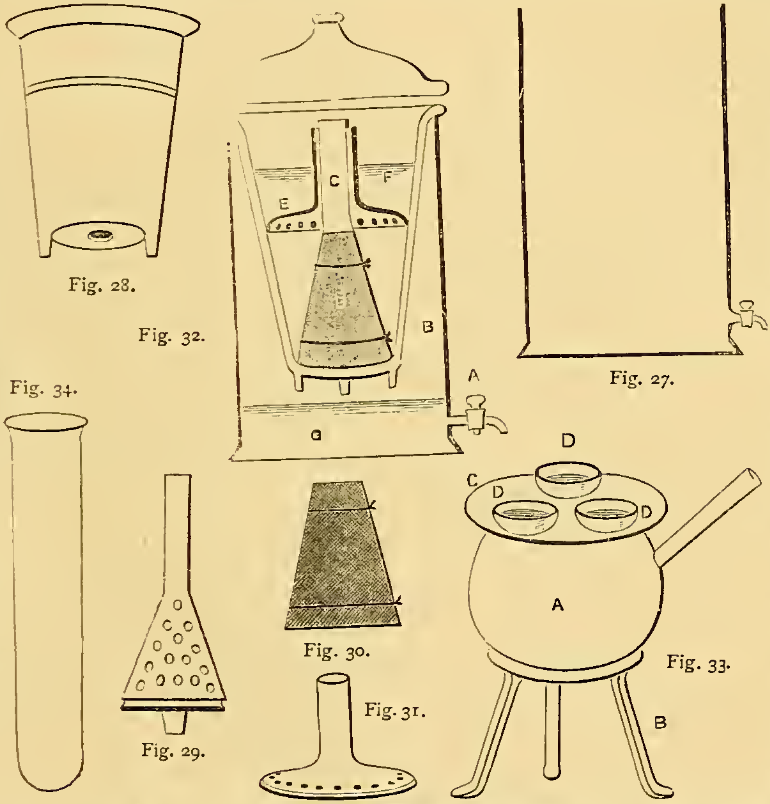
To make an accurate analysis of a sample of water is far beyond the power of the average amateur. It requires considerable knowledge and experience, and the use of expensive apparatus; but there are a few rough and ready tests, which may be applied by anyone who has dabbled in chemistry, as probably most of my readers have. The first thing to be done is to boil some of the water to dryness, and to examine the residue. The boiling down can be effected in the apparatus shown in Fig. 33,* which consists of a saucepan half-full of water, supported over a gas-burner, or other source of heat, by a suitable stand. (In the sketch, an iron tripod is shown.) In place of the usual lid, the saucepan is provided with a circular piece of tin-plate, pierced with three holes of about 2½ inches diameter each. The holes are fitted with little porcelain evaporating basins, which serve to hold the water during evaporation. All being ready, the gas is lighted, and a portion of a measured quart of the water under examination is poured into one of the basins. Into another is poured a portion of a like quantity of a water of known average purity. The water in the saucepan presently boils, and the hot steam rising against the bottoms of the basins, warms and evaporates the water contained in them. As this evaporation proceeds, more water is poured into the basins, until the whole of the two sample quarts has been driven off in vapour, leaving the solid matter previously held in solution behind. The object of using the saucepan (or "water-bath," as it is called) is to prevent the burning of the residue, which would otherwise happen unless great care were taken. Having compared the two residues, both as to quantity and appearance, the naked flame is applied to the bottom of the basins, cautiously and gradually. "If the original residue is white and powdery in appearance, that is, so far, a good sign; but if it is partly white and partly yellowish or greenish, and especially if there are gum-like stains round the residue, then, on heating those parts of the residue, we shall probahly see them darken, fuse, and burn away in part, giving out fumes having a disagreeable smell. If the blackening is considerable, much organic matter is present; but if the smell is

* Copied from a sketch in Professor A. H. Church's "Plain Words about Water," a little pamphlet which will well repay perusal. It is published for the Committee of Council on Education, by Chapman and Hall (1877, 36 pp., price 4d.)

offensive (like burnt feathers), then it is certain that the organic matter is of animal origin, and is, therefore, more likely to be unwholesome, or even poisonous." (This and a later quotation are from Professor Church's pamphlet.)

The residue should next be tested for "phosphates." A little of it is placed in a "test-tube" (Fig. 34), and, drop by drop, sufficient strong nitric acid is added to dissolve it. Then some drops of a solution of ammonic molybdate are added, and the mixture is warmed over the "Bunsen" gas flame. If phosphates are present, a lemon yellow coloration will be produced, or, if the phosphates are present in large quantity, a solid substance of yellow colour may be formed, and fall to the bottom of the tube. Water giving this yellow coloration should almost invariably be rejected.

While the water is being evaporated to dryness, another portion may be submitted to other tests. Some should be poured into a test-tube, and a few drops of hydrochloric acid added. Then a solution of sulphuretted hydrogen gas in water is poured in, and the tube is well shaken. If a brown colour is imparted to the water, the poisonous metal lead is almost certainly present.



FIGS. 27–32.—MAIGNEN'S FILTRE RAPIDE. FIG. 27.—OUTSIDE CASE. FIG. 28.—INNER CASE. FIG. 29.—FILTERING FRAME. FIG. 30.—FILTERING CLOTH. FIG. 31.—SCREEN. FIG. 32.—FILTER IN SECTION (A, Outside Case; B, Inner Case; C, Filtering Frame; D, Filtering Cloth covered with Carbo-calcis; E, Screen; F, Unfiltered Water; G, Filtered Water). FIG. 33.—APPARATUS FOR EVAPORATING WATER (A, Saucepan; B, Iron Tripod Stand; C, Perforated Tin Plate; D, Porcelain Basins). FIG. 34.—GLASS TEST TUBE.

Another portion may be tested for common salt. This substance, although harmless in itself, and to be found in small quantity in all waters, is, if present in large quantity, almost a sure indication of sewage contamination. To ascertain whether it is present in abnormal quantity, a few drops of strong nitric acid are added to a sample of the water contained in a test-tube, and then one drop of a solution of nitrate of silver. The test-tube is shaken up. If a white curdy substance is formed, the water should be held in suspicion. If, however, a mere cloudiness is produced, such as would result from adding a few drops of milk, the salt is present in only ordinary proportions.

To another portion of the water in a test-tube a few drops of "Nessler's Test" are added. The tube is held over a piece of white paper and the colour of the liquid noted by looking downwards through its whole length. The water will probably have acquired a slight yellowish tinge. Anything deeper than the very lightest straw colour proves the presence of more ammonia than is good. The ammonia, in its turn, proves sewage contamination.

As a last test the following may be applied:—"Fill a clean white teacup with the water to be tested. Add about sixty drops, or a drachm of weak sulphuric acid; stir with a clean slip of window glass; now pour in enough, of a weak solution of permanganate of potash to render the water a rich rose colour. Cover the cup with a clean glass plate. Now, if there be much organic matter in the water, the colour will go in a few minutes, and more permanganate may be added, and still lose its colour. It must be recollected in using this test that peaty matters and iron salts, which are not necessarily unwholesome, give the same result."

If the above tests are carefully applied, a very fair general idea as to the purity of the water under examination will be obtained. Nothing more can be hoped

for without a proper analysis. The test solutions may be obtained from Messrs. Griffin and Sons, of 22, *Garrick Street*, *London*, *W.C.*, at the prices mentioned below.

	s.	d.
Nitric Acid (strong) in 2 oz. bottle . .	0	8
Ammonic Molybdate " " . .	0	7
Hydrochloric Acid " " . .	0	7
*Sulphuretted Hydrogen " " . .	0	7
*Silver Nitrate " " . .	1	2
*Nessler's Test " " . .	0	11
Sulphuric Acid " " . .	0	7
Permanganate of Potash (solid) per oz. .	0	6

The prices are for the solutions stored in bottles with inferior stoppers. If well ground stoppers are desired the prices are 5d. each higher. For the three solutions marked with asterisks good stoppers are very desirable. Berlin porcelain evaporating basins, 3 oz. size, cost 9d. each ; test-tubes, 6 inches by $\frac{5}{8}$ inch, 9d. per dozen. The bottle holding the sulphuretted hydrogen solution should be kept, stopper-end downwards, in a dark place. So long as the solution retains its smell of rotten eggs it is good, but in course of time it decomposes with deposition of sulphur upon the side of the bottle. When the smell is completely gone the solution is no longer of use.

I have now only to wish my readers success in any attempts which they may make in the construction of filters, and to remind them that if they encounter any difficulties help can be obtained through the medium of the column for "Amateurs in Council."

HOW I BUILT MY FIRST COIL.

By R. WILLIAMS.

DURING the long winter evenings, when no pleasure is to be got abroad, many an amateur has felt wearied sitting by the fireside with little to do. Among the many subjects which claim his attention is electricity. It is derived from the Greek word *elektron* amber, as its properties were first discovered in that substance. Electricity is of two kinds—frictional and voltaic, but it is with voltaic that we have to deal just now in the form of induced currents. Induced currents are obtained from magneto-electric machines, coils, etc., by the making and breaking of the circuit many hundred times in a minute. We are greatly indebted to Messrs. Ruhmkorff, Hearder, Bentley, and others for the perfection to which they have brought the induction coil. The coil may be used for medical and scientific purposes, and also for amusement. The coil is divided into two parts the primary and secondary. In some of the scientific coils used for spectroscopic and other work, the secondary wire is 280 miles long. Much amusement can be got from a small coil, such as I am about to describe ; and I do not think the amateur will grudge the money and time spent on one when he has finished it. It may also be used for medical purposes in cases of rheumatism, in the same way as the magneto-electric machine. Many cheap coils are being sold now-a-days, but I would not advise the amateur to buy one. A really good one costs from 15s. up to £9 or £10, according to size ; but you can make a small one, with condenser, etc., for about 10s., which would cost 15s. or 20s. to buy it. I will now proceed to describe the coil.

The requirements for building such a coil are not many, and are within the reach of every amateur. To make one of the dimensions I am about to describe, you will require one oz. of No. 24 cotton-covered wire, and two or three ozs. of No. 36 cotton or silk-covered wire (silk, of course, being preferable but more expensive), a bunch of annealed iron wire, a small piece of platinum foil and wire, four binding screws, and some pieces of brass, a piece of mahogany for a base-board and for ends to the reel, and a few tools, among which may be mentioned a soldering iron. Having given you a general idea of what you will require, I will now proceed to give instructions for their manufacture.

1. A coil without a regulating tube.
2. One with a regulating tube and condenser.

And, first of all, in order to make the reel, take a piece of mahogany about $\frac{1}{4}$ in. thick, and cut out two circular pieces $1\frac{1}{4}$ in. in diameter, as in Figs. 1 and 2. A hole is now drilled through the centre of these pieces $\frac{3}{8}$ in. in diameter (not $\frac{3}{16}$ as shown in Figs.); this is to allow the core to pass through them. Two smaller holes are drilled in one of the pieces with a fine bradawl near the hole in the centre, as in Fig. 1 ; the second one being only about $\frac{1}{8}$ of an inch from the centre hole. Two holes are also drilled in the other piece, as in Fig. 2. The next part is the core ; it consists of a bunch of annealed iron wire cut into pieces $2\frac{1}{2}$ inches long. When you have cut them straighten them out. Now get a brass tube $\frac{3}{8}$ inch *bore*, and pack all your wire into it, leaving about $\frac{1}{2}$ inch of the ends projecting out of the tube ; now take a piece of brass or very thin iron wire and wind it tightly round the end of the wires, always pulling them further out of the tube and winding until they are out altogether, when you must tie the wire you were winding with. It does not matter how they are wound if it is wound tight enough. Now take a file and file the ends of the core even and smooth. After you have done this, place the core, wire and all, in the fire until it is red hot (about 15 minutes

will do), then lift it out with the tongs, and bury it among the ashes beneath the grate, and leave it there to cool of itself. Don't put it amongst water or you will spoil it. When cold, take it from among the ashes (it will take two or three hours to cool), blow off any dust which may be upon it, give it a gentle heat, and put it into your dish of melted paraffin. This is not the paraffin we burn in lamps, but a white substance resembling wax, and can be procured at any electrician's, or if you cannot get it, procure two or three pure paraffin candles and melt them in a dish. After it has been among the paraffin for about three minutes, take it out and allow it to drip above the plate. When it is hard you may proceed to finish the reel. Take off the wire you had round the core (it should now remain in a solid lump, like a small iron rod) and fix on the two pieces of wood, one at each end; they should go on tightly if properly made; leave about $\frac{1}{16}$ inch of the core projecting at one end: the other end should be flush, as in Fig. 3. Now take a piece of foreign note paper and cut a strip exactly the length of your core between the two ends. Then roll two thicknesses of it round the core, and cut off the rest. Melt a little paraffin over it to make it adhere tightly, and rub off the excess with a hot wire (not too hot). You will now be ready to wind on the wire. Take the thickest, No. 24, and pass about 3 inches of it out through one of the holes in the end where the core projects, and proceed to wind on the rest of the wire round the core (above the paper) in a close, even layer. When you reach the other end, wind it back above the first layer until you reach the end at which you started, then push the end through the other hole, and draw it out tightly. There will be a good bit of your wire left, but it will be useful. Cut the wire off about 4 inches from the end of the reel, and the primary wire will be complete. Melt your paraffin again, and with a hot spoon pour it over the wire you have wound until the cotton is saturated. Take your paper again, and put one thickness over this wire, covering it completely, give it a rub with a hot wire, and it will adhere to the paraffin on the first coil of wire. Now take your secondary wire, No. 36, push 4 inches through the hole in the opposite end to the primary wire, and proceed to wind as you did the primary, always turning at the ends, until the whole of it is wound on except 4 or 5 inches, which you pass through the hole above the other. The ends thus left are for connections. As this wire is very fine, great care must be taken in the winding, as it is easily broken. As an example of how to wind on the wire, it is wound in the same way as a reel of cotton thread. Before proceeding further, you should see if the circuit is complete by joining the secondary wires to a battery and galvanometer, but take care you don't break them off. Now melt your paraffin as before, but this time in a cup or jug, or anything in which it will cover the coil completely over head. Now place your coil in it, and set it down by the fire in a pretty hot place (not too hot for burning the cotton on your wire), and allow the paraffin to soak into it for about an hour, then take it out and allow it to drip. It should drip off the ends altogether, but if any remains scrape it off; but take care and don't cut off the ends of your wire, as the fine wire is very brittle. You now get a piece of velvet, any colour, cut a strip the exact length of wire between the ends (as you did your paper) and as long as will go round the wire. It is then drawn tightly round and sewn with a thread. The velvet is to protect the wire and give a more finished look to the coil. In the next paper I will describe how to make the connections, etc.

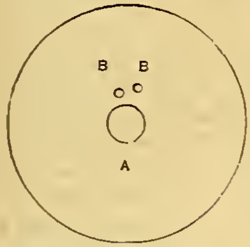


FIG. 1.—END OF REEL.
A, Hole for Core; B, B, Holes for ends of Primary Wire.

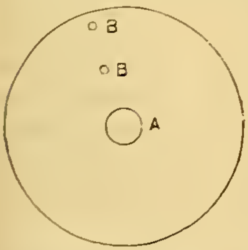


FIG. 2.—END OF REEL.
A, Hole for Core; B, B, Holes for ends of Secondary Wire.

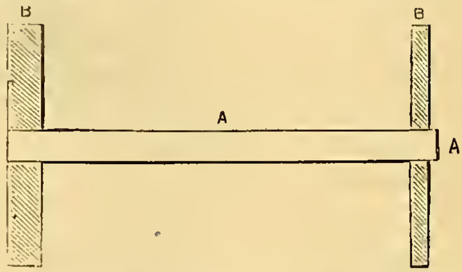


FIG. 3.—FORM OF REEL WHEN ENDS ARE PUT ON CORE.
A, A, Core; B, B, Mahogany Ends. N.B.—Both ends should be of the same thickness, viz., $\frac{1}{2}$ in.

AN ORNAMENTAL CLOCK HOUSE.

By JOHN ABBOTSON.

HAVING myself derived much instruction from the pages of AMATEUR WORK, it occurs to me that it might prove interesting to other readers were I to give a description of an article of which I have constructed a few, and which have been so much admired that I have numerous applications

from friends for copies. I mean an ornamental clock house, as shown in the elevation, Fig. 1.

Things to contain a small clock can of course be purchased, but I write for the amateur like myself, who prefers to make his own. Moreover, the bought articles of this nature are extremely "jerry;" won't stand the knocking about of servants' dusters, nor of Master Frank's prying fingers, and, if presentable, cost much money, whereas the article I propose is better-looking, solid and heavy, and almost unbreakable, while the cost is but a shilling or two.

I assume the amateur to have a lathe, and that about him he may be able to pick up a few bits of hardwood, such as may be found in the *debris* of any workshop. Even without a lathe a pretty thing can be made, by carving the pillars instead of turning them.

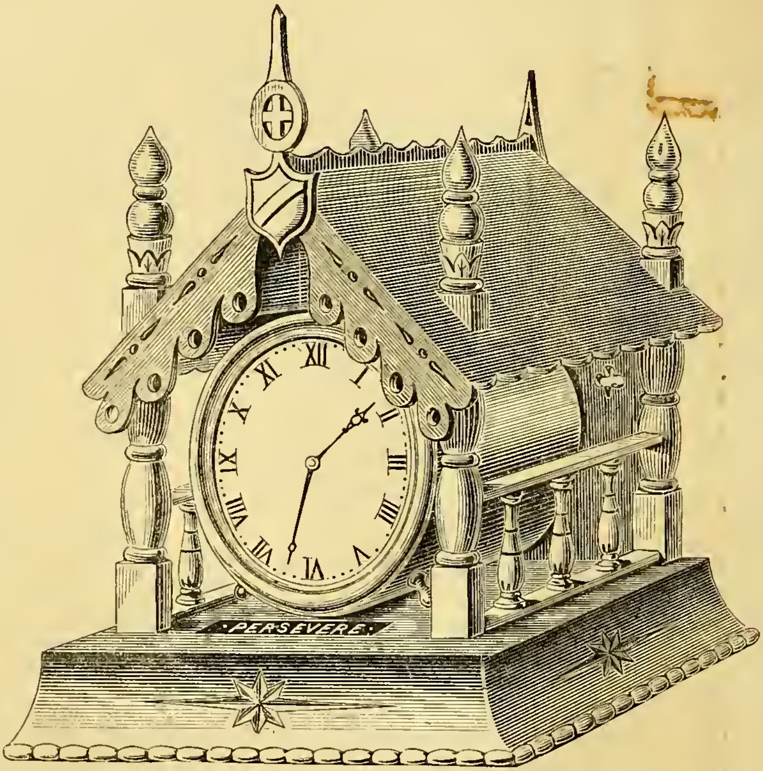


FIG. 1.—PERSPECTIVE VIEW OF ORNAMENTAL CLOCK HOUSE.

The first thing to be done is to prepare the base, which is simply a rectangular block of the heaviest hardwood at hand; among the best sorts being ebony, lignum vitæ, mahogany, or sabicu. This should be $1\frac{3}{4}$ or 2 inches thick, 8 by $5\frac{5}{8}$ inches for the bottom surface. One side (the back) is left square, and the other three bevelled off with a slight concave, starting from half an inch above the lower edge, so as to leave that much square on which to fasten the base moulding or beading. A half-inch bevel will leave the upper surface 7 by $5\frac{1}{8}$ inches.

For the beading, turn up in the lathe enough of the same wood a trifle over $\frac{1}{2}$ inch square; split it fairly with a fine saw, fit the two corners and glue on to the three sides, also driving in headless tacks to help. Here I wish to say that I never fail to assist glue when possible, by screws, nails or wooden pins.

Now to ornament the base. Around the sides and, if desired, on the front portion of the upper surface, pencil out any suitable devices, say, stars, flowers, or crest and motto, and cut them out $\frac{1}{16}$ inch deep for inlaying with any different coloured wood, or with bone, metal, etc. As, however, very few amateurs will care to trouble with this tedious work, recourse may be had to the following method, which will serve every purpose. Saw or file up for dust a small quantity of the desired inlaying wood. For most blocks, black ebony is my favourite, and a bit of an old ruler has lasted me for years. With a chip fill the cuts of the design with hot glue and rub in the dust until it stands above the wood. Let this dry hard, and then file off level, when it will take a keen eye to tell it from the more tedious inlaying. Now I advise to polish the block at once, and if unacquainted with the art of French polishing, the amateur can do almost as well by giving it several coats of "knotting" varnish—threepennyworth at any paint shop will do the whole house—this dries as fast as rubbed on (with a rag rubber), and gives a fine gloss. I find it invaluable in my workshop.

For the pillars, procure four pieces *over* 9 inches long, and plane them truly to $\frac{3}{4}$ inch square; I prefer greenheart, but any obtainable hardwood will do; mark the square and round parts, as per Fig. 2, and turn the latter portions in the lathe, leaving a tenon of 1 inch to fit tightly into the block, the minaret to be 8 inches high. Inlay devices on the bottom squares. For these pillars, bore four holes *perpendicularly* in the block, and so arranged that the former may stand when in place, $\frac{1}{2}$ inch from the sides and $\frac{3}{4}$ inch from

the front edge, whilst allowing $4\frac{1}{4}$ inches clear to admit the clock. The rear pillars may go within $\frac{1}{8}$ inch of the back of the block, which is not bevelled.

Next for the railings, turn six little balusters, three for each side, leaving a small tenon of $\frac{1}{8}$ inch at each end to hold them in the rail, top and bottom. Mahogany or ebony balusters look well; they are to be $1\frac{1}{2}$ inch in the clear. Place the pillars in their holes, measure and fit the rails, the upper of which, with the three-sided cross-piece, C, Fig. 2, are to be mortised in $\frac{1}{4}$ inch, and exactly fitted so as to keep the pillars parallel; the bottom rail is only a block. Take all asunder, glue in the balusters, when dry fit each pair of pillars together, and drive all home with glue, having an expanding wedge under each pillar, the round hole for which will have been gouged out a little wider at foot. To save injuring the points of the minarets in driving, it is best not to remove the spare end as the pillar comes out of the lathe. This can be cut off after driving home, and the point filed round.

Try the work with a square, and screw on a temporary back to keep things right while the roof is being fitted. For the latter, plane down two bits of board (oak looks best) to about $\frac{1}{4}$ or $\frac{3}{16}$ inch thick, each to make one side of the roof. Begin by having those pieces longer and wider than they *appear* to need, as one is liable to make a mistake here. Remember that the roof is to project at least $\frac{1}{2}$ inch in front of the pillars. In each square cut two holes to fit down over the square parts of the pillars, and persevere until they do fit exactly, resting on the bevelled cross-pieces C (which must have two screw holes in each) and their upper ends meeting at any desired angle. If an ornamental ridge be desired, let both roof-pieces meet a strip cut into scallops or points, and laid vertical between them. Cut the side eaves into $\frac{1}{2}$ inch scallops, put the roof in its place with strong glue, running a three-cornered strip along beneath the ridge inside, and fastening down the whole with two small brass screws from inside through each cross-piece. Now fit on a proper back of wood similar to the roof, first polishing the inside surface, as it cannot be easily got at afterwards. Let this fit up underneath the roof, which will just end flush with it, screw it to the pillars, driving also a few headless brass pins down through the roof to prevent the back warping. Next, out of a bit of oak, carve out something like the device in front of the elevation, Fig. 1; this is a shield surmounted by a Celtic cross, and looks very neat. Fasten on truly in the centre with glue and fine screws, the heads being let well in, and the holes plugged with the same wood as the shield to hide them. For the front eaves, cut with the fret saw or penknife two thin strips, as in the elevation, $1\frac{1}{4}$ inch deep, and fitted to butt against the shield. Glue them on against the roof, driving three headless pins in each to assist.

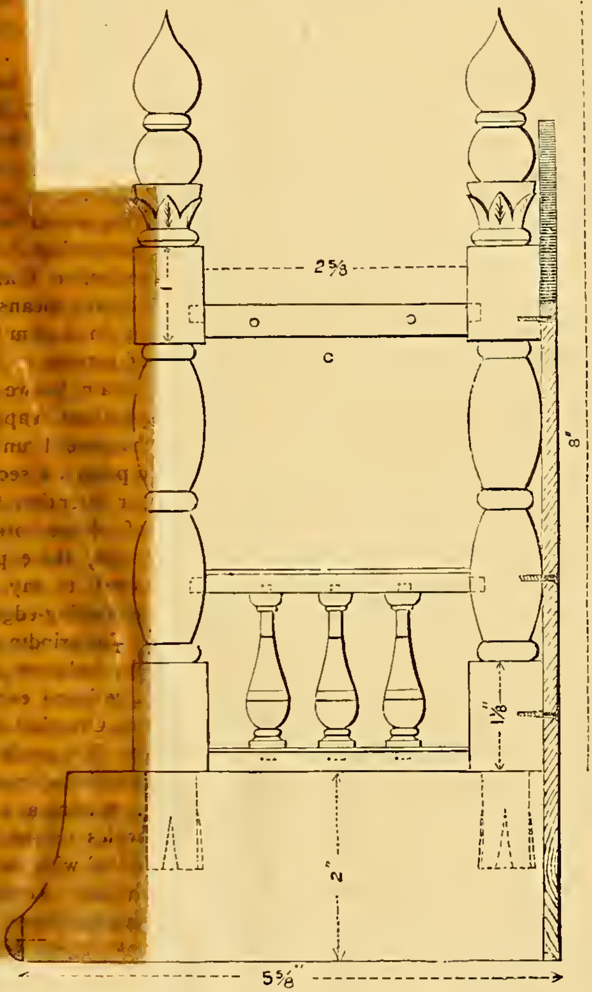


FIG. 2 — END ELEVATION OF CLOCK HOUSE WITHOUT ROOF. Scale, Half Size.

The next operation is to clean up for final polishing, which latter being done, paste a piece of red velvet on the bottom, and the house is ready for its tenant, which may be one of those neat little American nickel plated drum-shaped clocks, which can be bought for 4s. 6d. or 5s.

Should a clock not be procurable at the time, a nice coloured "scrap" may be gummed on inside the back. One I presented to a Freemason, looked well when inlaid with masonic emblems. The ornamentation, however, is a matter of choice.

WOOD-WORKING MACHINERY FOR AMATEURS.

By A. W. J. TAYLER, C.E., A.I.M.E.

VII.—MOULDING AND DOVETAILING MACHINES—CUTTING-EDGES OF TOOLS—GRINDING & TEMPERING.

MOULDING MACHINES in wood-working machinery would naturally come under the same classification as planing machines, and, after saws, must be put down as the most important. As the moulding capable of being executed by a hand-power machine is exceedingly limited, confined in point of fact to such things as small mouldings for picture-frames, small beadings, etc., we will not here enter into any portion of the history of the development of moulding and shaping machines, but proceed at once to describe a small combined sawing and moulding machine, manufactured by Mr. James Rigg, *Phœnix Ironworks, Chester*. This little machine is most peculiarly adapted to the requirements of amateurs, but it would also be found a most convenient and useful tool for cabinet and pattern makers; the fact of its combining two such useful tools together renders it most valuable to an amateur, creating as it does a saving in first cost and also in the room taken up by the machine. As will be seen by glancing at the illustrations (Figs. 28 and 29), this little tool can be either driven off a small counter-shaft by a light gas or steam-engine, or it can be mounted upon the stand (Fig. 29), fitted with a hand-wheel, crankshaft, and treadle for driving by foot power. As a circular-saw bench, this machine is so arranged that it may be used not only for sawing and cross-cutting, but also for mitring, tenoning, grooving, etc. As a moulding machine it is capable of moulding, tongueing and grooving, trenching, tenoning, rabbetting, etc.

This machine can be had from Messrs. Rigg, complete as shown in the sketch, to carry saws up to 8 inches. The price, including one circular saw, head-stock, parallel guide and spanner, is £7 15s.; the price of the iron stand, with treadle, complete as per sketch, is £3 10s.; bevel guide, 16s. 6d.; moulding head, £1 17s. 6d.; and cutters, 5s. per set of two extra.

In Fig. 30, we illustrate a patent dovetailing machine, recently invented by Mr. Tighe Hamilton, *of Dublin;* Messrs. Powis, Bale & Co., 20, *Budge Row, E.C.*, are the sole agents in London. It is the only machine of the kind capable of performing very fine work in a satisfactory manner; the smaller sizes are arranged with a treadle to be worked by the foot, this is not shown in the sketch. The remarkable feature in the machines is that they operate by the peculiar motion imparted to an ordinary circular saw, the different forms of steel cutters, which almost invariably produce misfits, being entirely done away with. The motion of the saw is a rotary and reciprocating one combined. The sizes of the tails and pins can be varied from the thickness of the saw up to any dimensions required in practice, their capacity ranging from the largest constructions down to the finest cabinet work, whilst in all cases the results are absolutely perfect. Tail or mortises can be cut in a pile of boards, but pins or tenons only in single boards. The machines are made of several types and forms, and their performance embraces every known sort of dove-tail joints, whether ordinary, or lapped, or mitred, or tongued and grooved. For cabinet work they would be found most invaluable to an amateur, performing dove-tailed grooving with a speed and perfection that no hand-work, however skilled, could by any means possibly effect. This is a very beautifully finished machine, and the work that it is capable of turning out is as near perfection as it is possible to attain, but we are afraid that the prices, which can be obtained on application, are unfortunately too high for the general run of amateurs; those, however, to whom price is a secondary consideration, will find this clever invention an invaluable aid in the manufacture of cabinet work of every description.

Before bringing these papers to an end, it will perhaps be as well to say a word or two upon the subject of the cutting-edge of plane irons and the angle of bevel for grinding hand-tools, small cutters, etc., the small grindstone shown in the illustration, Fig. 31, would be found extremely useful. It is supplied by Messrs. Churchill & Co., *Finsbury, E.C.*, at a very low figure. The machine is run with a clutch, so that when the treadle is pressed down it starts off in the right direction, running at a high or low speed as may be desired; besides a stone 8 inches in diameter by $1\frac{1}{2}$ in. thick, it is fitted with an emery buff 8 ins. in diameter by 1 inch thick. Revolving cutters, such as those used in moulding machines, are exactly similar in their action to that of circular saws; they should be ground at an angle of about 25° to the face of the iron for soft wood, and at about 40° for hard wood. Turners' finishing tools, which are sharpened on both sides, and ground off obliquely on their face, should be at angles of 110° and 70°. Obtuse angles in such tools are in general a mistake, as they really scrape or abrade instead of cutting. The best cutters are those made of wrought iron faced with steel, as they are easier to make and less liable to fracture than those made of solid steel. The very best quality of steel should be employed in the manufacture of cutters, that combining in as high a degree as possible toughness with hardness is the most suitable for the purpose.

Auger bits, mortise chisels, and other small tools that have angular corners, can be sharpened best with files of various sections, triangular, square, round, half-round, knife-edge, flat, and other; some small slips of Washita or Water of Ayr stone should be also at hand for finishing with. The slips should be ground to a variety of forms on their edges. Ayr stone is undoubtedly the best, but it is now becoming very scarce, the sources from which the supply was derived being nearly exhausted.

The operation of grinding a tool to a cutting edge appears so simple that most people are totally unaware of the large amount of knowledge, as well as skill, that can be displayed in merely sharpening a tool. One must have a thorough acquaintance with the nature of the material to be cut, and also some experience in cutting it, in order to know what variation it may be necessary to make in the tool in order to adapt it to the differences in texture, closeness of grain, hardness, etc., which are always to be found in different specimens of the same material, before being competent to give a tool a suitable cutting edge.

A cutting edge is formed by the line of junction of the two facets at the point of a wedge. The angle of these facets one to the other is determined by considerations of strength, and the shape of each facet is determined either by considerations of strength or shape. It may be taken as a general rule that the harder the material to be cut, the more the approach of the two facets to a right angle one with another ; the greater the strength required, also the nearer the facets to a right angle. Where strength is the main consideration, it must be obtained at a sacrifice of keenness; but where sharpness is the main consideration, then strength is disregarded. Regarding the question as to on which side of a stone a tool should be ground, it depends entirely upon the amount of metal requiring to be ground off, the conditicn of the grindstone, and the shape of the tool to be ground. The operation can be performed with more expedition if the tool is held in such a position that the revolving surface of the stone runs towards the operator ; but this mode is attended with some danger, as the edge of the tool is very liable to catch in a spot or in any soft part in the stone, and to be dragged from the fingers, when they may be very seriously injured by being carried violently against the rest, and caught between it and the stone. Where the tool last received the action of the stone there is always formed what is called a feather edge, a fine, ragged web of metal which does not separate from the body of the metal. Soft metal has always more feather edge than hard metal. The amount of pressure upon the stone also affects this edge, so that the operator should allow for this by making the pressure the heaviest during the first stage when the object is to remove the superfluous metal, and the least during the latter part of the process, when he is finishing the cutting edge. If the stone runs very true, and contains no soft or hard spots sufficient to cause the cutting edge to catch, facets should be ground with the stone running towards the cutting edge; if these favourable conditions are absent, as is often the case, it is better to have the stone running from than towards the cutting edge, as the damage to the edge of the tool, were it to catch in the stone, would be very serious, and would necessitate a great amount of extra grinding, and consequent waste of metal to repair it. It is also much easier to hold the tool steady with the stone running from the edge. The surface of the grindstone must, in this latter case, be kept level across the width of the perimeter of the stone, and for this purpose the truing device illustrated in Fig. 32 will be found very useful. It can be instantly applied to the face of the stone, and works automatically without interfering with its constant use, and without raising any dust. All that is necessary is to clamp the main stand securely upon the trough, close to the face of the stone, leaving it until the desired result has been obtained. The water need not be removed from the trough. This useful little article can be had from Messrs. Churchill. The price, with a 7 inch roller, is £4 10s. ; with a 12 inch roller, £5 12s. 6d.

Fig. 33 represents another grindstone dresser, Brunton's Patent, made by Messrs. E. P. Bastin & Co., *West Drayton.* It consists of a single steel disc, set at a particular angle and arranged to traverse across the face of the stone. A circular face can be given to the stone by this arrangement, thus ensuring a good supply of water on the stone whilst grinding, as by a well-known law the water seeks the highest point. The price of this dresser, to dress grindstones up to 4 inches in width, is £5 15s., larger sizes are also made.

For those who may find a difficulty in holding the tool to be ground, the simple arrangement illustrated in Fig. 34 would be of service. It can be had from Messrs. Churchill for a trifling cost, 2s., which it will amply repay. It requires no explanation, the mode of using it being self-evident. It merely consists of a frame through which the plane-iron or other tool to be ground is passed, being held in position by a clamp; a small wheel fixed beneath travels on the surface of the stone. The tool can be ground to any desired angle by adjusting its position in the frame.

To produce a smoother edge than can be produced by the grindstone, the oil-stone must be resorted to. Care must be taken to keep the facets being stoned, level with the face of the stone. A wire edge will be formed upon the tool, even when the greatest care is taken ; to reduce this as much as possible by finishing

up with a few light strokes upon one and then upon the other facet, repeated several times, to still further reduce the wire edge for very fine work, a piece of leather glued upon a piece of wood will be found most serviceable. For putting an extra sharp edge upon cutters, a mixture of three parts of glycerine to one of alcohol will be found most efficacious and cleanly instead of putting oil upon the stone.

Another most important question is the proper temper of cutters and tools, and as the temper is often destroyed in the process of grinding, and it becomes necessary to re-temper a tool, it is desirable that an amateur should understand enough of the subject to be able to perform the operation himself. The right temper for tools varies according to the nature of the wood to be operated upon; for soft woods, the temper should be a light straw colour; for harder woods, the temper may be slightly harder in proportion. In the tempering of any kind of cutters or tools, it is of vital importance that there should be a gradual shading of colour in the temper. If there should happen to be a distinctly marked line between two colours towards the edge of the cutters, it is very likely to chip or break at this line. The great object to be attained is to have the edge of the cutter tolerably hard, and this hardness reduced gradually the further you get from the cutting edge, the softer metal at the back thus strengthening and supporting it.

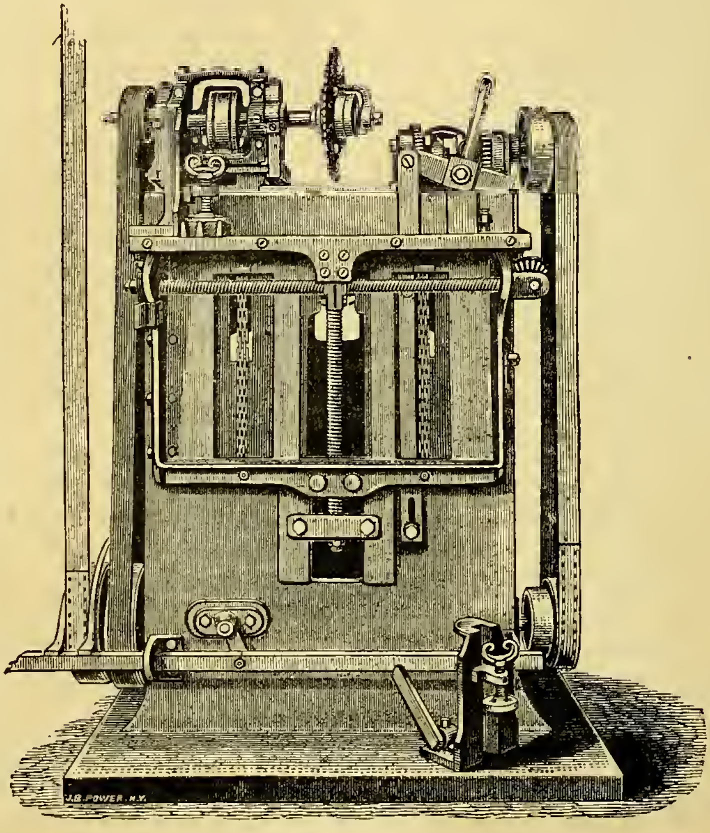


FIG. 30.—TIGHE HAMILTON'S PATENT DOVETAILING MACHINE.

Where a fire may not be always at hand, the patent gas-heater, illustrated in Fig. 35, would be found handy for tempering drills and other small tools; it can be obtained from Messrs. C. Churchill and Co.; the price is 4s. 6d. It is stated to be capable of making a bar of steel, ½ inch in diameter, red hot in six minutes, and to heat a ¼ inch bar sufficiently to be hardened in two minutes.

To Temper Turning Tools.—First file up and harden the tool. This is performed by slowly heating the cutting end of the tool in a clear fire, when of a bright red heat, cooling it quickly in water, it will then be in a very hard and brittle state. Then brighten its end with a piece of emery-cloth wrapped round a file, place the shaft of the tool in the flame of the gas-burner, the brightened end being clear of the flame by about 1 inch or 1½ inch. Watch this part for the appearance of the light colour. If the bright parts should get smoked, rub them quickly bright again with the emery-cloth, and replace the tool in the flame as before. As soon as the required colour appears on the bright parts plunge the end of the tool into cold water. It would be impossible to lay down any hard and fast rule for the letting down of colour, as it differs, of course, widely with the different qualities of steel. With some, a pale straw will be sufficient, whilst others must be let down nearly blue. It is a good plan to try the tool with a file quickly at the different shades of colour, when the nature of the steel is entirely unknown. The operation of tempering should always be performed by daylight, as it is very difficult to distinguish the pale straw colour by artificial light.

For hardening cutters, the following will be found an excellent recipe: Four parts of powdered yellow resin and two parts of train oil, carefully mixed, and one part of heated tallow added. Dip the article to be hardened into the mixture whilst hot, and allow it to remain in it until it is quite cold.

In conclusion, we may observe that there are, of course, a great number of articles which are positively

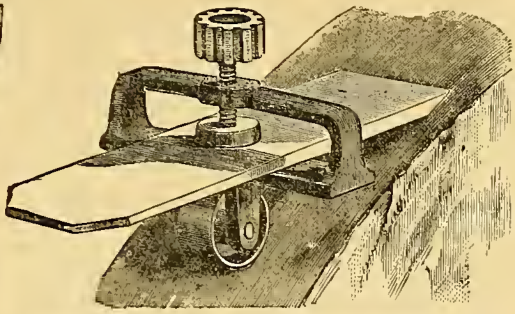


FIG. 34.—TOOL-REST (NEWTON'S) FOR HOLDING TOOL WHEN GRINDING.

FIG. 35.—PATENT GAS-HEATER.

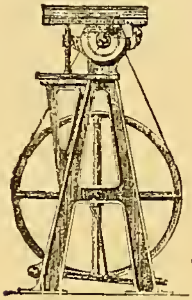


FIG. 29.—STAND FOR SMALL COMBINED SAWING AND MOULDING MACHINE, SHOWN IN FIG. 28.

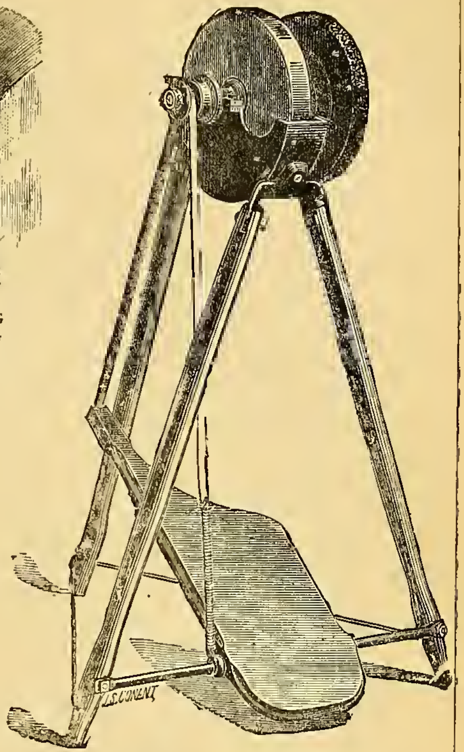


FIG. 31.—SMALL GRINDSTONE.

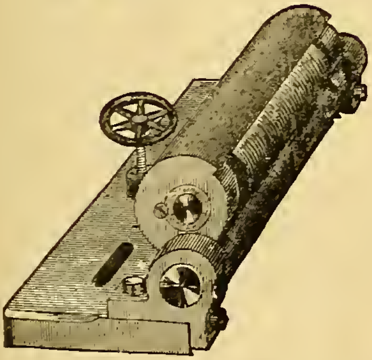


FIG. 32.—GRINDSTONE DRESSER.

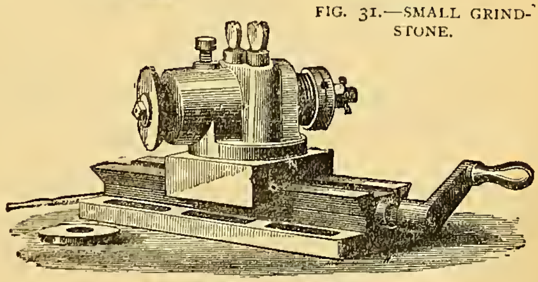


FIG. 33.—BRUNTON'S PATENT GRINDSTONE DRESSER.

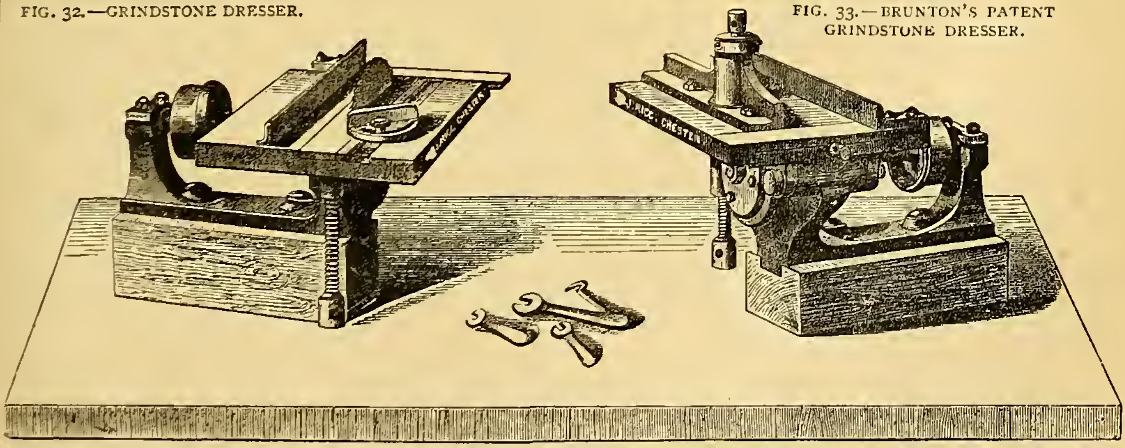


FIG. 28.—SMALL COMBINED SAWING AND MOULDING MACHINE.

necessary about an amateur's workshop, but which do not come under the same class as machinery, and which for the most part he will be able to construct for himself without much trouble, such as carpenter's bench, glue-heaters, etc. Useful hints and instructions for these and other articles will doubtless be found both in former and future parts of AMATEUR WORK. We have given a brief description of all the small wood-working machines of a really serviceable character made by engineers, that can be driven by foot and hand-power, with which we are acquainted, and which would be suitable for an amateur, except the foot-lathe, the most ancient machine known, and most undoubtedly not one of the least in importance. The lathe, however, need not be noticed in this series of papers, which is now brought to a conclusion, for it has already been described in the pages of this Magazine, and the description that has been given will be immediately followed by articles on lathes now in the market that are low in cost and within the power of amateurs of even the most moderate means to purchase. Instructions will also be shortly given in Lathe-making, which will enable any amateur who can use his carpenter's tools with good effect to make a cheap and useful lathe for himself.

PRINTING FOR AMATEURS.

By A PRACTICAL PRINTER.

II.—PARTS OF THE LETTER—FOUNTS—CLASSIFICATION OF LETTERS—WOOD LETTERS—HOW TO CAST DUPLICATES.

IN my last article we carefully avoided using technical terms and phrases, devoting our attention to a general outline of the entire subject before us. If the reader desires to have something more than a mere superficial knowledge of printing, it will be necessary to study the nomenclature of the art, which, if acquired at the outset, will enable the matter to be pursued in the various technical publications of the day, which would be sealed books to the amateur printer without some such preparation as these papers are intended to supply.

The engravings in the margin will enable us to become acquainted with the general characteristics of a metal letter as used by printers. When a set of letters is spoken of, be it large or small, it is always designated a fount of type. A single type would be spoken of as a letter. This applies to all letters and type, irrespective of the size of the letter or the materials of which they are composed.

The novice, on looking at it, would mentally describe its various parts as top, bottom, sides, notches, etc., but the technical terms—face, counter, beard, shoulder, shank, nick, groove, and feet—call for some explanation before they would be recognized. Even the parts of the letter formed upon its face have designations applied to them. Thus, the straight flat stroke of a flat letter is a stem; the fine lines at the top and bottom of a letter are serifs; and a projection over the shank or body, like that at the top of the letter f, is called a "kern." The counter is the space between the lines of the face. The face *b* (Fig. 2) is the part from which the impression is taken; *c* is the shoulder, while the part represented by the shaded lines running from the face of *c* to the top of the letter, is designated the beard; *a* is the shank or body, *d* the nick, *e* the groove, and the parts on either side the groove the feet. It will be well for the reader to make himself at home with these terms, as they are often made use of.

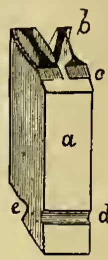


FIG. 2 — PARTS OF A LETTER.

Very few amateurs will attempt the manufacture of the smaller sorts of type, as the accuracy which they demand renders the use of delicate and expensive machinery absolutely necessary. But the larger sorts may be attempted by anyone with ordinary mechanical talent and manual dexterity applied in the way we shall point out. All English type is of one uniform height from feet to face, viz., $\frac{15}{16}$ of an inch, and in printer's parlance is called "type high." In the absence of any better means of making this measurement it will be useful to know that a shilling, standing edgewise, is type-high, and may be used in this manner for testing the accuracy of any wood block, stereotype, or letter about to be used with other letters in a page of type or forme, as it is called. While the measure of all letter is invariably $\frac{15}{16}$, or type high, from feet to face, it differs in width of body, or from side to side, according to the letter formed on its face. Thus the letter M, shown above in Fig. 2, is on a perfectly square shank, but the letter I would be only just wide enough to support the face of the letter, with perhaps a little spacing to ensure regularity between the various letters in a fount. These matters form the care of the letterfounder's designer, whose business it is to arrange new and attractive forms of letters for every purpose to which printing can be applied; but at the same time we must understand the principles which regulate the size and form of printer's type. The depth of the body from top to bottom of its face is exactly the same for every letter, figure, and sign in any particular fount of type. This depth of body determines the name of the size of type, irrespective

FIG. 3.—NICKS IN BODY OF LETTER.

of the shape or size of the letter formed upon its face. The approximate number of lines to a foot of any given size of letter is shown in a table given below; but this cannot be taken as absolutely correct, on account of a most regretable want of agreement between the various typefounders to use a common standard measure; so that pica letter, which measures $\frac{1}{6}$ of an inch in depth *exactly* from one founder, might be a hairsbreadth over from another, and a shade under this measurement from another. Thus it is that types of the same style and size from one founder cannot be used mixed with the letter from another maker, and not only on account of the difference in size of body, but the face of the letter might be a little higher up or lower down upon the shank, and thus produce an irregularity in printing which could not be allowed on any account.

To provide against this difficulty, and to afford means to recognize any particular fount, the nicks (*d*) on the shank of the letter, are placed in various positions, higher up or lower down upon the body, and they may also vary in number; generally one to three nicks are used as in Fig. 3.

The names given to the sizes of type appear to be purely arbitrary, and their origin is involved in obscurity. A few examples will serve to show their general appearance to the eye in printed matter:—

Nonpareil Type, used principally for books and other fine work.
Brevier Type ,, ,, ,,
Long Primer Type ,, ,,
Pica Type ,, ,,

The complete series of names and sizes, with the number of lines to the foot, is shown in the following table. It will be remembered that the M is on a square shank and measures both ways the size of the type, *i e.*, in pica, $\frac{1}{6}$th of an in. square, so that this letter is the standard measure to printers, just as the inch is to the carpenter and others. When used as a term of measurement, it is called an "em," and all other types are calculated with reference to the Pica "em," but any special body of type may be described as in the following table, in which so many ems of its own body equal one foot:—

	Ems to foot.		Ems to foot.
Diamond	208	Pica	72
Pearl	178	English	64
Ruby	163	Great Primer	52
Nonpareil	144	Paragon	44½
Emerald	130	Double Pica	42
Minion	128	2-line Pica	36
Brevier	112½	2-line English	32
Bourgeois (pron. *ber-joicé*)	104	2-line Great Primer	26
Long Primer	89	2-line Double Pica	21
Small Pica	84	Canon	18

Type larger than canon is reckoned by the number of lines of pica that it contains, as 8-line, 12-line pica, and so on. It is most useful to remember that some sizes of type exactly equal two lines of some smaller type—indeed, special 2-line letters are cast to many bodies of type, and are specially used to produce the advertisements seen in the daily papers, thus:—

PRINTING.—Wanted a youth as apprentice to the printing business: must be well educated. No premium required. Apply X. Y. Z.

Many regular sizes of type exactly equal two lines of some other, as may be seen on reference to the table of

RELATIVE SIZES OF TYPE.

Double Pica,	equal to 2-line	Small Pica.
Paragon	,, ,,	Long Primer.
Great Primer	,, ,,	Bourgeois.
English	,, ,,	Minion.
Pica	,, ,,	Nonpareil.
Small Pica	,, ,,	Ruby.
Long Primer	,, ,,	Pearl.
Bourgeois	,, ,,	Diamond.
Brevier	,, ,,	Minikin.

To each body of type are cast proportionate quantities of Spaces and Quadrats (Quads), which are simply short bodies, or shanks of type, without any letters on them, and varying in width, to produce spaces between words and letters. A "Fount" is the term applied to a set of letters, without regard to its size or extent. So that a fount may be a one pound (in weight) or a thousand pound fount, according to the purpose for which it is intended, and the extent of the work in hand. A complete fount of letter is comprised under nine heads, containing the following sorts:—

1. *Capitals.*

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Æ Œ &.

2. *Small Capitals.*

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Æ Œ.

3. *Lower Case.*

a b c d e f g h i j k l m n o p q r s t u v w x y z æ œ ff fi ffi fl ffl.

4. *Figures.*

1 2 3 4 5 6 7 8 9 0.

5. *Points, etc.*

, ; : . ? ! - ' ( ) [ ] * † ‡ § || ¶ — ——

6. *Four kinds of Spaces, viz.: Hair, Thin, Middle, and Thick.*

7. *Em and En Quadrats.*

8. *Two, Three, and Four Em Quadrats.*

9. *Accents and Signs.*

The letters are classed into short, long, ascending,

descending, and kerned letters. Descending letters are g j p q y, in Roman and Italic. In the Roman f and j are the only kerned letters, but in the Italic *d g j l y* are kerned on one side, and *f* on both sides of its face. Their beaks being liable to accident, especially the Roman f, when at the end of a line, they are usually cast in larger proportion than otherwise necessary. Some Italic capitals are kerned on one side of their face, *A T V W* require special attention, that their angles may not fall upon an ascending letter that may stand next to them. The double letters fi ffi ff fl ffl, are formed for the convenience of one kerned letter joining with another, as their beaks would be damaged by coming in contact with each other.

The whole fount includes not less than 150,000 letters, figures, spaces, etc. Beside the distinctions named, there is the general one between book-letter and job-letter. To the latter class belong the beautiful ornamental and fancy types, which now vie with the engraver in producing elegant lines and flourishes, in combination with rich designs for borders and backgrounds. Job letter consists, for the most part, of a great variety of small founts, which enable circular-heads, bill-heads, business cards, and such like, to be produced with the striking contrasts between thick and thin letters, wide and narrow ones. Many of these, and certainly enough for the amateur's purpose, cost only a shilling or two per fount, while book-letter is required in such quantities, that pounds take the place of shillings. An easy way of calculating how much type you would require for any job is to allow 1 pound in weight for every 3 square inches to be set up solid. Thus, a page 4 inches × 3 inches, = 12 inches, divided by 3, would give 4 lb., add 50 per cent. for very small founts for sorts in boxes not required in the page, you have 6 lb. as the quantity required to do such a job. An idea of the cost of type may be gained by the following, taken from a published list of small founts for amateurs :—Nonpareil, 4s. per lb.; Brevier, 2s. 4d per lb.; Long Primer, 1s. 10d. per lb. ; Pica, 1s. 6d. per lb. ; Great Primer, 1s. 4d. per lb., and so on. Larger quantities would be, perhaps, 25 per cent. less ; job founts and fancy letters double these prices, as the demand is much less in weight for these, and the manufacturers' outlay for original matrices to cast the type in is so much the greater in proportion. Above 10-line (pica lines), letter is generally made in wood, although wood-letter is often made as small as 4-line. The best wood-letter is cut on some close-grained hard wood, well seasoned, the face of the letter showing the end-grain of the wood. Commoner and cheaper kinds are cut on the side-grain, but these are apt to warp and split up into cracks from the action of the ley and other alkalies used to remove the ink when washing the formes. Very much wood-letter is still made in the most simple way. A piece of suitable wood is procured, even in grain, and free from shakes and knots, planed type-high, made smooth and even with fine sand-paper; the outline of the letter is then traced on it, and the sunken parts removed with gouges, chisels, or gravers. Rotary cutting-tools have also been used, and the letters moved under the tools, so as to cut away the parts required. Unlike metal types, which are sold by weight, wood-letter is sold by the dozen pieces ; and, consequently, the smaller the letter the lower in price, ranging from 1s. per dozen for 4-line to 5s. per dozen for 30-line. Fancy and ornamental designs would advance in price exactly proportioned to the labour in cutting them. The 2 and 3-colour letters seen on posting-stations are mostly cut in wood, the parts which appear in one colour being separate pieces from those which show in another. Large lines, such as "Auction," "Drapery," "Sale," etc., are often cut on one piece of board ; and any such line required by the amateur may be readily made at home in the manner referred to above. Hard wood is not necessary ; for large illustrations for posting-bills, in which the lines are not very fine or close together, may be, and often are, cut upon a piece of even-grained pine, quite soft, and free from faults of every description. Such blocks should not be thoroughly cleaned from ink after use, as the ink hardens on the face of the lines, and makes a better surface to print from.

The amateur may have some ability in designing and drawing free-hand, and yet be unable to execute any work of the kind we are considering, because it necessitates drawing backwards, or the reverse way it will appear when printed. This may be obviated in two ways—first, by drawing in pencil on tracing or other thin paper the lettering or design required ; then paste the paper face down upon the wood, when the design will present itself ready for cutting. The outlines may be followed with a sharp penknife or a shoemaker's knife, always bearing or leaning the cut well outwards, or away from the edge being cut. The material between the edges may be removed by narrow chisels and gouges, or, in the absence of these, successive strokes of the knife. Wide spaces may be recessed by boring a number of holes with the centre-bit or twist-drill close together, and clearing away with the chisel. If single letters are required, they may be formed on a strip of wood, and afterwards divided with the saw. The other plan is to procure a freshly printed letter or letters from a poster. If the ink has dried somewhat, moisten with turpentine the back of the paper, then press down upon the wood, lay a stiff paper over the print, and, steadily holding all from shifting, rub on back of paper with a smooth, hard

substance, such as the handle of a tooth-brush, a glass bottle, or other convenient article. The ink will leave the paper sufficiently to produce a clear impression to work by. If cut on hard wood, end or side grain, it is best to soak in linseed oil thoroughly before using. All wood letter is best put away on its edge when not in use.

A very simple and efficient substitute for letter cut out of wood may be made by cutting the letter out of some thin substance, and then affixing it to a solid base, which, together with the letter, should be type-high. One of the best substances for this purpose is kamptulicon, or other good floor-cloth, which is homogeneous in substance, comparatively elastic, and soft to cut or manipulate. Only plain letters, having no very fine lines, can be made this way, but large letters are the very things required by this kind of material. No backward drawing is required, as the sketches may be made on the material itself, which is afterwards affixed in such a way, that the reverse side is upwards. Any pattern that may exist on the cloth must be filed or rubbed off with pumice-stone, and the side which will form the printing side made quite smooth. The letter may then be cut out in the same way as directed for cutting on wood.

Glue may be used to fix on the letter to the wood; but if so, a little bichromate of potash must be put in the glue, to prevent water readily softening it when cleaning the type. The best solution to use is india-rubber dissolved in naphtha, which is now easily procured at gutta-percha boot-shops. If difficulty is experienced in procuring it, it may be made by getting some black bottle-rubber (not vulcanized sheet or old rubber articles), and cutting it up into shreds; put into a bottle, and pour over it some wood naphtha, enough just to cover it. Shake occasionally every hour or so, when it will gradually soften, and become a thick viscid mass. This may be smeared on the back of the thin letters, a board laid on them to keep flat, and left a day or two to harden. If india-rubber solution cannot be obtained, take a little shellac, and pour a similar quantity of naphtha on it; treat in the same way till it is as thick as cream, or a little thinner; this sets quickly, and is not readily acted on by alkali, though not so tenacious as the rubber. If the floor-cloth is not obtainable, cardboard may be used, mounted on wood, as previously described. In this case a few coats of thin shellac varnish over the entire face of the letter would preserve it against the combined effect of oily inks and sharp alkalies for a long time.

If the amateur possess any regular letters, and is short of any particular letters, or, in printer's language, is "out of sorts," he may duplicate the letter by a process of stereotyping. A cast of the face of the letter may be made in plaster of Paris, some old type metal melted and run in, and this may be filed up on the back, and mounted on wood, to be used with the regular letter. Amateurs who desire to make smaller type than could conveniently be cut out by any of the methods described, may resort to making some in moulds of various materials. Plaster letters may be cast in plaster moulds taken from other metal types. The modes of dealing with material have been so clearly described in the pages of AMATEUR WORK, that we have no need to introduce it here, only to add that the plaster letters must be well dried and baked, steeped in linseed oil, and allowed to dry slowly in the air, when they will be found to be sufficiently tenacious for the purpose.

Perhaps the most satisfactory of all the materials for this purpose is that compound of sulphur known as "Spence's Metal." It is tolerably tough, very cheap—about three shillings per pound. It may be poured into an article to form the mould, and when cold, heated Spence's Metal may be poured into it without danger if not overheated. These casts will all allow of the amateur exercising his ingenuity; and although not so good and durable as regular materials, will enable many who are not in a position to procure the regular articles to go on in the strength of their own resources, guided and directed by AMATEUR WORK.

(*To be continued.*)

NOTES ON NOVELTIES.

AMONG the various pens and ink pencils that have been recently offered to the public, Messrs. Thomas De la Rue and Co., *Bunhill Row, London, E.C.*, have recently produced one that is likely to come very generally into use, and to be adopted by most of those whose avocations render it desirable for them to carry a pen in the pocket, as well as by all who like a pen that is provided with a continuous flow of ink, grudging possibly the time lost in dipping the pen into the ink bottle. The pen now under notice is called "The Anti-Stylograph," being a self-feeding reservoir penholder, carrying a pen with ordinary non-corrodible nibs, and not a stylus, or point, through which the ink makes its way by means of a small and hardly perceptible hole. The penholder itself, constructed on Hearson's Patent, Messrs. Thomas De la Rue and Co. being the sole licensees, is made apparently of vulcanite, in two sizes, $4\frac{3}{4}$ inches long for the pocket, and 6 inches long for the desk, the former being sold at 2s. 6d. each, and the latter at 3s. 6d. The pen, when not in use, is protected by a cap, which is taken off and placed on the other end when its owner wishes to write with it. The pens, which are veritable nibs, and which perform their peculiar function with ease and freedom, provided that the penholder is properly charged, and the directions for use carefully

followed, are renewable at pleasure, and are supplied in boxes at 1s. per box; gold pens, with iridium points, being furnished at 10s. 6d. each, if preferred. It is not possible here to enter into the construction of the penholder. This is explained at length, both by diagram and description, on the directions issued with each box. The nibs are of three kinds: No. 1, fine; No. 2, medium; No. 3, broad. Each penholder, fitted with a nib, is sent out in a cardboard box, accompanied by a glass filler, at the prices above named, or in leather-covered boxes at 1s. extra. The penholder has the merit of being simple in construction, and the nib pleasant to write with. Moreover, the penholder is easily cleaned when requisite. Of course, care is required, both in the use of the pen and its management; but if strict attention is paid to the directions that are so fully and plainly given for its use, I do not think that any one who uses it will fail to find it a most desirable pocket companion, or addendum to the writing apparatus on his desk.

Messrs. D. H. Cussons and Co., of 79, *Bold Street, Liverpool, and Stockport*, send a handy little vade mecum for amateur photographers, entitled, "The Photographer's Pocket Almanac and Reminder," size 5 in. by 3 in., number of pages 52, price 2d. It is peculiarly useful and valuable, because it furnishes, in a compact and handy form, a description of all recent inventions and appliances in photography, meetings of photographic societies, with a full list of their officers, in addition to a calendar of the months for 1883, with blank spaces opposite the days of the month for memoranda. It is illustrated with a good specimen of Woodbury Type Photography, consisting of an instantaneous view on the Mersey, photographed on a Liverpool dry plate with the Liverpool instantaneous shutter and lens. The photograph is wonderfully clear and distinct, and when examined through a magnifying glass, the details of the vessels at anchor and the steamboats in motion become apparent, which, from their smallness, are not noticeable when the picture is viewed with the naked eye. Besides affording a list of photographic appliances and studio accessories and apparatus supplied by themselves, Messrs. D. H. Cussons and Co.'s Almanac also contains reminders of the specialties of other dealers in articles necessary or desirable for the prosecution of photography, and price lists of mounts, frames, etc. Among other useful information is Messrs. Cussons and Co.'s price list for permanent enlargements in carbon from photographer's own negatives, on paper, canvas, or opal, and finished in monochrome, water-colour, or oils. Amateur photographers who are about to fit up a studio, such as that which has been described and delineated by Mr. Parkinson, will find this Almanac an unerring guide to everything they can want or wish for in the way of photographer's upholstery.

Messrs. Abel Heywood and Son, 56 *and* 58, *Oldham Street, Manchester*, send "The Engineer and Building Trades Almanack and Artizans' Year-Book, 1883," 8⅝ in. by 5⅝ in., 80 pages, price 6d. In this a "Review of the Science of 1882" is succeeded by the ordinary indispensable almanack matter, occupying together sixteen pages; and this portion is followed in its turn by sixty-four pages of useful information on a variety of subjects, mainly gathered from *The English Mechanic*, the *Joiner and Builder*, the *Pharmacist*, and other professional sources. Among the numerous articles that will prove useful to amateurs are brief papers on "Amateur Gilt Frame-making," "Carving Fret-work," and "A Lesson in Filing." Mr. Thomas Fletcher, of Warrington, is laid under contribution for some pertinent remarks on "Gas as a Workshop Tool." Among the recipes, of which many very useful ones are given, the following "wrinkle to joiners" may be quoted as a sample:—"If you have a very hard oilstone, with scarcely any 'grip' in it, apply a small pinch of flour-emery with the oil; the effect is almost magical. A hard, useless stone becomes as useful as a piece of the best Turkey; in fact, an oilstone may be made of a piece of stout sheet-zinc." Every amateur workman should buy and keep a copy of this almanack from year to year for the sake of the miscellaneous information it contains. It is not too much to say that in every page of it something useful will be found, although different persons will not fail to ascribe different degrees of utility to each according to their peculiar bent.

My readers will doubtless remember that in the last Part of this Magazine I noticed the "Pattern Book for Art Metal Workers," the first part of which was sent by Mr. A. Fischer, 11, *St. Bride Street, London, E.C.* Since my comments appeared I have received from the same publisher a specimen part of another work, very similar in character, namely, Part 1 of the Sixth Series of the "Art Workman," price 1s. 6d. That a costly production like this should have entered upon its *sixth* series bears stronger witness in favour of its importance and utility than any words of mine could do, and I will, therefore, content myself with describing the contents of the part which now lies before me. Its size is 15½ inches by 11½ inches; this will give some idea of the dimensions of the plates, of which there are seven, accompanied by two pages of letterpress, giving a brief description of the subject-matter of the plates themselves, and some additional art memoranda culled from various sources. The subsidiary title of "The Art Workman" proclaims it to be "A Monthly Journal of Design for the Artist, Artificer, and Manufacturer, edited by L. Eisenlohr and C. Weigle," and that it is precisely what it claims to be, and that its scope is wide enough to embrace art work of every kind, is proved when I say that the seven plates exhibit beautiful specimens of etched ornamental iron work, a cabinet with marquetry in relief, ornaments for surface decoration, an ewer in crystal with silver mountings, chairs and arm-chairs, a necklace, brooches and lockets, and an example, *in colours*, of the border of a woven fabric of 1440, preserved in the Museum on the Michaelsberg at Bromberg. This pattern, which is remarkable for the beauty and freedom of the design taken as a whole, the boldness and nice proportion of its curves, and the arrangement of the ornamentation it contains, is given in two parts, so managed that the pattern of which the entire border is composed, in repetition, is exhibited in its entirety from its commencement to its finish. The colouring, though somewhat quaint, is as good as the design, and in perfect harmony with it. The reproduction of it fails only in being too regular, and conveying the idea of a design in fresco painting rather than one copied

from a woven fabric in which, from the very nature of the work, the interlacings of warp and woof must present rectangularity in the crossings and re-crossings of the threads, when looked at close to the eye, but which, of course, are lost as the distance between the eye and the object is increased. I have dwelt rather on this plate, because, although the other plates are better calculated to do service to the professional workman than to the amateur, it is worth all the money asked for the whole part as an example for decorative work in painting on glass, and for use in a new kind of work in imitation of stained glass, on which an article will very shortly appear in this Magazine, accompanied by a Supplement or Supplements, if need be, in colours.

From Mr. John Mangnall, 17, *Piccadilly*, *Manchester*, I have received what I may term a fly-leaf, with regard to a material which he has patented for pipes for the conveyance of water and other fluids that may be substituted for lead pipes. I cannot do better than give this fly-leaf *in extenso*, for if the material is what it is stated to be, it cannot be too widely known, or too generally used in the interest of health and sanitation. It runs thus:—"Many natural waters possess the property of corroding and dissolving lead to a dangerous extent, resulting in what is known as 'lead-poisoning;' where, however, sulphates of the alkalies or earths are present, the evil is remedied by converting the metallic surfaces into an insoluble sulphate. What nature thns effects *in the course of time* and under *favourable circumstances*, is *at once realized* in *Vulcanized Lead*, the surface being converted in the process of manufacture into an insoluble sulphite which is unaffected by any natural agency, and equally resists the action of weak acids, ammoniacal vapours, salts, etc. For mineral water manufacturers, brewers, wine and spirit merchants, it replaces the more expensive block tin or tin-lined pipes which hitherto were indispensable for storing or conveying liquids of an acid tendency; and in Sanitary Engineering it is especially valuable, being unaffected by the agencies which rapidly corrode ordinary lead, and lead to leakages of the most noxious and dangerous character."

I have no doubt that Mr. Mangnall will readily answer any inquiries as to the cost of his pipes. I am sorry that he did not send me his price-list, that it might have been in my power to say something on this important point here. Whenever an article is noticed or a book reviewed, presuming that what is said about it is said for the information on every necessary point of those who may read the notice or review, I argue that it is only reasonable to say everything that can be said with regard to size, weight, if need be, appearance, and price. Many books remain unbought by those who read notices of them because the size and price are not notified. We all know that this is done through anxiety that it may check the incoming of advertisements for the advertising columns. For my part, I never have hesitated and never shall hesitate, to give publicity to what I believe to be a good thing on this account. The notice is *sowing*, the advertisement is *watering*, and if the owner or seller of the article does not care to do *his* part towards *fructification by sale*, I do not see what reason that is for me not to do mine. And I am glad to say that the Publishers of this Magazine are of the same way of thinking in this matter as myself.

The inquiries lately made by amateur poultry keepers with regard to incubators have brought two pamphlets, size 7¼ in. by 4¾ inches, price 6d. each, from Messrs. Conrad, Phelps, & Co., 75, *Fleet Street*, *London*, *E.C.* One of these is entitled "Artificial Egg Hatching for Profit," to which is added "Chicken Rearing," and contains 26 pages; the other contains 31 pages, and is called "Farm Poultry." The author of "Farm Poultry" and "Chicken Rearing" is Mr. G. L. Hillier. Much useful advice on poultry keeping and poultry hatching may be gathered from the books, which deserve to be far better illustrated than they are.

Messrs. R. Melhuish & Son, 85 *and* 87, *Fetter Lane*, *Holborn Circus*, *London*, *E.C.*, have just issued a new catalogue for professional workmen and amateurs, enumerating the various planes, saws, and tools that they keep in stock for the use of stone-masons, bricklayers, carpenters, joiners, coach-makers, carriage and waggon-builders, millwrights, engineers, plumbers, jewellers, metal-workers, etc. The catalogue is fully illustrated and very nicely got up, each page being enclosed by red rules; it is sold over the counter for 6d. One excellent point about it is that it is a retail catalogue as well as a wholesale one, prices of single articles being given wherever it is absolutely necessary. This is most desirable as far as the amateur is concerned, as his purchases run to units rather than to dozens. The same article of necessity is figured and priced in various catalogues issued by dealers, and I find on examination and comparison that Messrs. Melhuish's prices rule low, and thus offer an advantage to the amateur buyer.

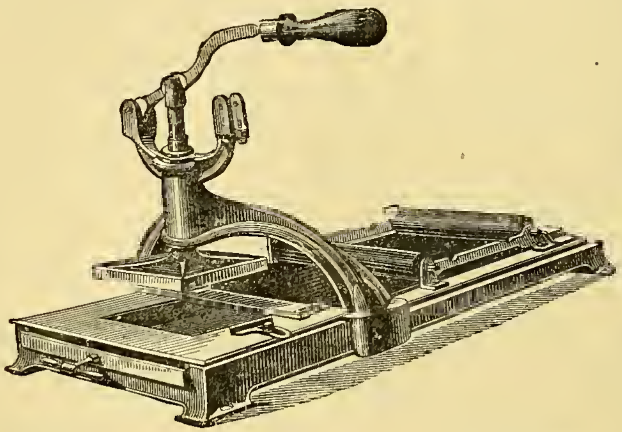
This may also be said with regard to the prices of articles supplied by Messrs. Harger Brothers, *Goldielands*, *Settle*, *Yorkshire*, who have many good lathes on their list at low figures. Among other things I notice the "Eclipse" Hand Machine for fret-sawing, which is supplied at 15s., and is useful in so far that it may be screwed up by means of a thumbscrew to any table, thus dispensing with a stand, and occupying but little room when not in use. A drilling apparatus is supplied with each machine. Messrs. Harger Brothers call special attention to Griffin's Patent Fret Saws, every tooth of which is perfectly set, thus causing the saw blade to run true. These are supplied, Nos. 00 to 4, at 5d. per dozen, Nos. 5 to 7 at 6d., and No. 8 at 7d., a reduction of 1d. per dozen being made if a gross of blades is taken.

Mr. James Gillingham, Surgical Mechanist, *Chard*, *Somerset*, sends his "Illustrated Prospectus of Artificial Limbs, Surgical Appliances, etc., together with Remarkable Cases." The book is most curious and instructive, showing how natural defects and losses of limbs, etc., may be remedied by mechanical contrivances; how, indeed, persons may be enabled to write who have no hands or fingers, and to walk without legs or feet. All who require to lie at full length, or in any peculiar position, should see Mr. Gillingham's Combined Couch, "The Universal," which, to use his own description, "makes 40 positions, 500 graduations, can be used for 50 purposes, and is capable of 50,000 changes;" while for round shoulders and weak spines, judging from its construction, his "Spine or Backboard Chair" must be most

useful. Those who are interested in warming greenhouses, conservatories, bedrooms, etc., should direct their attention to Gillingham's "Patent Radiating Heat Generator," "Patent Heat Radiating Hot Dresser," admirable for supplying bottom heat, and "Patent Radiator with Hot Water Jacket." The inventor of these useful appliances has suffered considerably through our present Patent Laws, which tend to extinguish inventive genius rather than to foster, protect, and encourage it.

The art of printing is possessed of peculiar attractions for the amateur, and there are few who do not require its aid in a limited degree at some time or other. Now, for all who wish to do a little actual printing for themselves in the way of business cards, or cards of any description, headings for notepaper, addresses, etc., on envelopes, or anything up to the size of a post card, or a printing surface 3½ inches by 2¼ inches, a neat little printing machine of American origin has been lately introduced into this country, under the name of "The Garfield American Model Automatic Self-Inking Printing Press." Having remembrance of the raid that was attempted, not very long ago, on the pockets of British simpletons by some enterprising individuals, who strung a few bits of tinplate and iron wire together, and offered it for sale as the "Garfield Sewing Machine," at the low, but, to them, highly remunerative price of 1s. 2d., I was naturally suspicious of anything that appeared under the distinctive and honourable name that this press bears, and examined it with more than usual care; but having seen it worked I can only say that it is everything that it is represented to be, and honestly worth the money that is asked for it, namely, £2 10s. This amount covers the press itself, but as a press is practically useless without type, 1000 pieces of American Fancy Types, with ink, etc., are supplied in a cabinet box, with divisions for the type, for an additional sum of £1 5s. Printing can be done with the utmost ease and facility in black and coloured inks, and in gold and silver, and the work is carried out with rapidity, impressions in ink being taken at a speed of 600 per hour, and in gold and silver at rather more than half that rate. The press may be seen in operation at 20, *Thorburn Square, London, S.E.*, the show rooms and house of business of Messrs. Charles Wilson and Co., agents in the United Kingdom for this press, the "Garfield Stylographic Pen," and other specialities of American origin and manufacture, including Christmas cards.

An accurate representation of the press is given in the accompanying illustration, and it will be desirable for me, for the benefit and better information of my readers, to give in addition to this a description of the instrument itself and its dimensions. The bed of the press consists of a solid iron frame, with projecting feet at the corners in which are screw-holes countersunk, by means of which the press may be screwed down to a table or counter if desired; the weight of the press, however, which is 17lbs., is sufficient to keep it steady and stationary for all practical purposes. The greatest length of the frame is 1 foot 1½ inch, its greatest width 10½ inches; the height, measuring from the surface on which it stands to the part of the lever to which the handle is attached, is 12 inches. The bed plate that forms the under part of the frame is 12 inches by 7½ inches. From projections on either side springs a solid iron arch cast in one piece with the frame, and having a flange and socket in front, in which works the shaft, to which the platen is attached. The type (or block) from which an impression is to be taken, is, when properly locked up in its chase, placed in the rectangular recess for its reception immediately under the platen, which is 4 inches by 3 inches in size. The inking rollers are attached to a frame, the handle of which is shown in front, and by which they can be drawn backwards and forwards over the ink slab below them and over the type. It will be noticed that there are two rollers; that in front being intended to carry the ink over the type, and that behind it to distribute the ink evenly over the slab. The tympan is formed of a piece of ordinary paper which is renewable whenever necessary.



THE "GARFIELD" AUTOMATIC SELF-INKING PRINTING PRESS.

A piece of thin cloth or felt, the exact size of the platen, is placed inside the paper, which is cut sufficiently large to allow its sides to bend upwards and lap over the sides of the platen, against which they are retained by a metal frame, which draws the paper as tight as a drum. When the type is in place and duly inked, and the material on which the impression is to be taken is placed over it, the lever handle is pressed downward, bringing down the platen and its tympan with sufficient pressure to ensure a perfectly clear and clean imprint of the block or type below.

It may be as well to add that the process of printing in gold and silver is exceedingly easy. In place of ink on the ink slab and rollers, which may be quickly cleaned when necessary by the application of a little turpentine, a small quantity of gold size, which is supplied with each machine, is placed on the slab. This is carried over the type, and the impression in gold size is taken in the ordinary way. When this has been done, a piece of ordinary cotton wadding is dipped in gold bronze powder, also supplied with the machine, and drawn lightly over the size, to which the powder adheres. Printing in silver is effected in precisely the same manner.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

ERRATA.

In the article on "The Dulcimer: how to make it," page 123, Fig. 5, there were inadvertently marked two holes as sound holes. The only holes in the back are for the legs of the iron bridge to pass through, the *f*-shaped hole in the belly being for sound.

"Fret-sawing Machine" (Sheet Supplement to Part 14).—Mr. DICKSON S. LAKER points out that the lowest mortise-hole (fifth from top) in Fig. 1 (backbone of machine) should have been drawn ⅝ inch *above* the fourth mortise-hole, instead of that distance below it, as shown in drawing. He says:—This does not interfere with the working of the machine, only *longer* saws must be used. Readers can easily make this correction in the Supplement for themselves.

Organ Building.

PEDAL (*Eccles*) cannot understand how pushing in the taper bit when making the holes in the caps of the Keraulophon pipes can cause the holes to diminish in size as the pipes get smaller. I will endeavour to explain. Suppose a bit tapering right off to a point is ½ inch thick at a distance of 2 inches from the point, it follows that if a hole is bored through the side of a pipe 2 inches in diameter and the bit is pushed through till the point just touches the opposite side, the hole made in the first side would be ½ inch diameter. If, however, the pipe was only 1 inch in diameter, the bit would of course only be pushed in an inch and the diameter of the hole it would make would only be about half what it is in the former case. Does this explanation make it clear to "Pedal"? I am glad you have been successful with the paper pipes. Reed pipes would be best purchased, but a Trumpet stop is quite out of place in a small chamber organ, as it is very loud. A soft Oboe or Clarionet would be the best to select.

E. BRAMALL (*Liverpool*).—Scales for fancy stops will be given later on.

A SUBSCRIBER FROM THE FIRST.—The voicing will be dealt with in the chapter on Tuning; it would take too much space to describe in this part of "Ours." Your pipes being affected by each stroke of the bellows shows that either the bellows or the wind trunk is too small, or that they are not supplied with sufficient wind from some other cause.

To A. Z.—I am glad you find the paper pipes answer. They will stand as much pressure as you like to put on them if you voice them and cut the mouths accordingly. I should be glad if you could forward to me, through the Editor, a printed list from the makers of the pipes you mention.

J. H. MACK.—*Organ-Blowing Engines.*—Joy's Hydraulic Engine, or an Otto Gas Engine, with Crossley's blowing apparatus. Half or one-horse power is sufficient. Cost of using depends upon the price of water or gas in the district in which you live. As a rule, the gas is cheapest to work.

J. H. (*Clifton*).—The cost of the two manuals depends very much on what you are charged for materials. It would be about £12, exclusive of the case, pipes, and keyboards. Of course this is if you make it yourself.

The paper pipes are my own invention, and cannot, so far as I know, be purchased. My time is too fully occupied to allow of my making any for sale, but perhaps some enterprising amateur may think it worth his while to do so.

J. B. (*Tyne Dock*).—The Flageolet is made the same as the Flute, the 2-foot pipe standing on the CC channel.

The Keraulophon can be made with the ordinary mouth, or with an inverted mouth, which you like.

The languids should all be nicked, otherwise you cannot regulate the tones so that all the pipes of each stop are similar in quality. You will find that the nicking enables the pipe to be blown harder without it overblowing.

C. T. (*Chester*).—1. The different expressions can only be obtained by having a swell. This will be described in due course.

2. Five stops are the utmost that can properly be supplied with wind at *the same time* with a foot blower.

3. You can have two feeders if you like.

4. There *is* a distinct stop called the Principal. It is made exactly the same as the Open Diapason, but is two or three scales smaller and voiced softer. It is not required in a small organ if you have a 4-feet Flute.

5. The Flute described is the Snabe Flute, and is about the best for general use.

6 The Piccolo is the same scale as the Flageolet, but made with the ordinary mouth. The Flageolet is not quite so squeaky.

H. S. (*Alfreton*).—The scales will do very well. Complete your wood Stopt Diapason and Claribella, and use them instead of the paper, but allow the slider on which they stand to be a little wider than is given in the specification.

The Gemshorn is the same diameter at the mouth as the Flute, therefore the measurement is taken on the top of the block.

The Bourdon is 8 feet long, or thereabouts, for CCC, each pipe in that octave being 4 inches shorter than the next lowest semitone; those in the next octave are 2 inches shorter than the next lowest semitones. I think you would find the brown papers answer better than the Manila for any sized pipes.

As regards the compasses, I presume you mean proportional compasses. They can be obtained at most mathematical instrument maker's. If you cannot get them, write to Stanley, *Great Turnstile, Holborn*, or to Archbutt, *Westminster Bridge Road, London.* If you want them for organ work you will find the line of polygons on a sector will answer the same purpose, and you can use ordinary compasses to measure with.

R. W. K (*Herne Hill*).—See reply to New Subscriber in page 144, Part 14.

A. G. B. (*Canning Town*).—Your specification will do very well, but it is not necessary to have two 4-feet stops on the great organ. As regards other requirements, follow the instructions given in the present number.

F. F. (*Bristol*).—The sound-board, 36 in. by 12 in., might accommodate two stops, viz., Open Diapason with stopt bass, and a 4-foot Flute; but a larger sound-board would answer better.

H. A. P. (*Glasgow*).—You could get the small 2-manual in the height you mention by planting several of the pipes of the soundboards, and by mitreing or doubling some of those that stand on it.

2. Yes; but the 4-feet and 2-feet stops run still smaller, as you will see by the table in Part 12.

3. Read the article.

4. Not unless you like to add them; but your room is too small for Bourdons.

5. The Open Diapasons and all of the other open stops, if made of wood, are tuned by the tin lids; if made of paper, then by the sliding piece described. The Flute and Flageolet are open pipes.

C. W. D. (*New Herrington*).—Diagrams will be published giving sections, designs, etc. See Supplement with this Part.

F. S. T. (*Holloway*).—The mode of setting out the scales has been described in the articles and in the "Amateurs in Council" many times.

For a different scale you have only to alter the length of the topmost cross line to the diameter of the largest pipe, if it is 4 feet long, and draw the sloping line down to the point, and all the other cross lines will be correct if measured to where they touch the sloping line. For a 2-foot stop you would alter the diameter at the 2-foot line, and proceed as before.

KERAULOPHON.—1. The pipes with inverted upper lips should have ears the same as ordinary pipes, and in the smaller ones the linen band is brought round so as to cover the opening which would otherwise exist, owing to the chamfer being turned to the inside of the pipe.

2. It is obvious that while a pipe is on the mandrel you cannot make another one on it, so while that is drying go on with others on different sized mandrels. When they are dry you can then make the other stops on the same mandrels. This should scarcely need an explanation.

3. The paper is stretched over the cork side of the block, as it gives a softer surface for working with.

4. Full compass pedals could of course be added, but they are not often placed on so small an instrument, as they of course increase the bulk of it.

LEX (*Kilkenny*).—1. The compass of the small two manual, scheme 3 in page 21, Vol. II., is, Open Diapason, Tenor C to G in altissimo. Bass CC to B. Swell, Tenor C to G in alt.

2. The Flute and Flageolet are made softer in tone by reason of the small scale, low mouth, fine nicking, and small opening at the foot.

3. Additional stops could be added if you

make the sound-board large enough, and put in one or two spare sliders.

4. The easiest swell to make is to enclose the pipes in a box, and have the top to open like an ordinary box lid by pressing a lever with the foot or the knee. This is, however, only a makeshift swell, but is better than none. Venetian and gridiron swells will be described in due course.

T. H. (*Gaisford Street*).—You need not cut any nicks in the stopt pipes for the small organ described in Vol. I. I however prefer to have them nicked. Hard wood is best for the grooving board, but good sound pine will do very well. As regards the sound-board, I quite agree with what you say. The only way to get good wood is to go to the timber yard and select it for yourself, firmly declining to accept any that is unseasoned, knotty, or in any way unsuitable. Buy as much as you can at a time. Plane it up, and then keep it in a dry, warm room as long as possible before using it.

LEX.—1. The groovings in the grooving board of the small organ described in Vol. I. would not be the same for the design shown opposite page 220, but would be made on the same method. Bore the holes through over the proper channels and run grooves to where the pipes are to stand. What can be more simple. See article on Sound-boards in present series.

Roller-boards will be described in due course.

The arrangement of the bass channels is not as you suppose, but is alternate, viz., CC at bass end, and CC s. at treble end, DD at bass end, DD s. at treble end, and so on. See bottom of first column of page 116, Vol. I. Careful reading of the articles would save many queries.

The sound-board could just as well be made with all the channels in regular order if desired, and no roller-board would then be necessary. Make it 3 feet 6 inches or 4 feet long, and on the principle described in the new series, and you will find it much more satisfactory, as each pipe could be made to stand over its own channel.

Pianoforte Tuning.

W. CORRAN (*St. Trinion's, Isle of Man*).—Instructions in re-stringing will shortly be given. It is unfortunately the case that when tuning and broking are carried on simultaneously, there is an inducement to a certain amount of "breaking," as a concomitant.

Painting on Porcelain.

THETA.—Your question as to colour-making by amateurs has been fully discussed. If you desire further information, please write again. The subject in the aspect regarded in the text, has been taken up in this series solely because the consideration which it received in one or two small works on china painting seemed to the writer unsatisfactory, and to a large extent misleading.

The Lily Mirror in Part 10.

X.Y.Z.—The panel, E E, Fig 7, is one half of the side panel, and F F, one quarter of the centre panel. In the sketch, Fig. 1 is by oversight drawn only twice instead of four times, and named as "half panel" instead of "quarter."

Papyrotiles.

113.—Papyrotiles are supplied to the trade only at 14, *Holborn Viaduct, E.C.* They may be purchased in small quantities at the European Art Galleries, Manager, Mr. T. J. Gulliche, *New Bond Street, W.C.*

Bachelor's Sideboard.

JAS. COWAN.—The designer of the Bachelor's Sideboard is pleased to find the actual working out successful, and thinks the adaptation of locker with desk and pigeonholes, the front falling with joints to hold it level, might be an additional feature in its use to some readers.

New Mode of Covering Floors.

C. F. A. (*Newport*).—The "Manila-paper" is so named from the Manila-hemp (*musa textilis*), which furnishes a strong fibre, suited for the manufacture of cables, etc. We know of no reason why any other thick paper, made from a coarse and strong, and therefore enduring, material, should not answer the purpose recommended at p. 42, Vol. II., as well as that made of Manila-fibre.

Painting on Terra Cotta.

M. H. (*Mellefont*).—With the exception that the terra cotta must be "sized," in order to more or less counteract its porosity, painting in oil on it is identical with painting in oil on prepared canvas, and colours of the same kind answer for both purposes. At the same time it may be stated that water-colour is much more common than oil painting on terra cotta. In this case Chinese white is largely used, either as a first coat, where desirable, or, judiciously mixed with the paint, as "body." The painting, when finished, should be well varnished, and may subsequently be washed whenever, from dust, etc., it may get soiled.

Bench Hook.

The small article sketched by HALF JACK is well known amongst carpenters and joiners: it is called a bench hook. It certainly is a very useful addition to any amateur's bench. [From a PRO.]

Dynamo-Machine.

LIGHT.—Some endeavour will be made to let some light in on this subject, when the space can be spared for the purpose.

Electro-Tinning.

A. T. C. S. (*Dresden*).—If this correspondent can wait long enough, he will see some articles on "Electro-tinning," in AMATEUR WORK. These will describe the application of tin to all metal work by electro-deposition, and will fully meet his requirements.

Dissolving Vulcanite.

EXPERIMENTALIST.—Rubber vulcanite cut into fine shreds may be dissolved to a liquid in boiling oil of turpentine. The process requires special arrangements and precautions, and is not unattended by danger, for the heat in any case must be raised to 212° Fah., and may have to be over 300° Fah.

Polishing Oak.

SCARLET BEAN must work down the rough parts of the oak with coarse and then fine glass-paper; rub with rag moistened in linseed oil, and when this has dried polish up with uncoloured polish.

Making Mackintosh.

R. W. G. (*Rathkeale*).—It is not possible to make Mackintosh cloaks, nor the cloth out of which they are made. If R. W. G. wants to know how to make oilskin for cloaks, the writer of this reply can tell him how to do it.

Paraffin as a Preservative for Eggs.

Q.—Paraffin is not a substance emitting a disagreeable smell, as some persons suppose. Pure paraffin is without any taste or scent, and might be used as a preservative for eggs. Sling the eggs in a thread cage or basket, and dip them quickly in a bath of melted pure paraffin. The thin film thus put on will entirely exclude air.

Substance to make Lather.

F. M. (*Manchester*).—Other substances beside soap, and other soaps beside common soap, will make a lather. If F. M. will let me know precisely what he requires, and the use he will make of it, I will try to assist him.

Bronzing Brass Chandeliers.

A. H. (*Carlisle*).—Mr. Edwinson will give instructions for bronzing, etc., at some future time. It is not possible to describe the process fully in this part of the Magazine, for it is one that requires care and special appliances. A preparation for bronzing metal is made by mixing one part each of oxide of iron and white arsenic with twelve parts of hydrochloric acid. The brass must be boiled in strong ley and scoured to remove any lacquer or grease that may be on it, and when dry brushed over with the solution. The metal must then be coated with varnish or clear lacquer.

Booth's Mitre Cutting Machine.

G. F. M. L. (*Saltburn-by-Sea*).—You can procure Booth's Mitre Cutting Machine and Corner Cramps, through any ironmonger, or of any dealer in tools and hardware whose address appears in the advertising pages of this Magazine. I am not acquainted with the book you name, and therefore I cannot speak with any certainty about it. Its author is a well-known writer of great ability, and as the book bears his name, it is pretty certain to be both useful and reliable.

Painting in Oils.

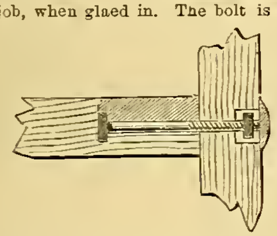
E. D. C. BD.—It is not intended at present to give papers on this subject. The description of the dynamo machine is in hand.

Heating Workshops.

R. N. R.—Ritchie & Co.'s Lux Calor Gas Stoves are useful and safe appliances for lighting and heating, and therefore for drying the air and warming a damp workshop. They are made to burn gas or oil as may be desirable, and vary in price according to size and design, from £3 3s. to £8 8s. Messrs. James Veitch & Son, the well-known nurserymen of *King's Road, Chelsea, S.W.*, made trial of one of them in a greenhouse facing north, and found that it was not only serviceable in creating and maintaining a high and equable temperature in 10 degrees of frost and a cold wind out of doors, but that it lighted the building nicely, and was perfectly innoxious to vegetable life. The stoves may be seen in operation at Ritchie & Co.'s, 23, *St. Swithin's Lane, E.C.*

Joining Wood by Bolts, etc.

C. W. C. (*Peckham*).—(1) In answer to your inquiry as to how two pieces of wood are joined horizontally by a bolt and nut, you must first make a scarfed joint and then bind the pieces together by *two* bolts and nuts passed through the overlapping ends of the pieces. Pieces cannot be joined in such a position by a bolt and nut in the direction of the pieces, or rather are never joined in this way in practice, although it is possible to do so with much trouble, which will be labour lost. The annexed diagram will show you how a horizontal piece of quartering may be joined to a perpendicular piece by a single bolt and nut. In the first place a hole of sufficient depth must be bored into the end of the horizontal piece and the wood cut away on one side and at the head so that the bolt may be dropped into its place. The hole made should be a little less than the diameter of the bolt, so the latter may be driven into its place and held by the surrounding wood as tightly as possible. The opening that has been made must be neatly filled up. A sliding piece cut dove-tail shape will make the most secure and neatest job, when glued in. The bolt is now



JOINT BY BOLT AND NUT.

fixed, and cannot be withdrawn from without, because the wood bedded against the inner part of the head prevents its egress. A hole is then bored through the perpendicular piece, through which the screw of the bolt is passed, a hole being sunk on the side opposite to that on which the screw enters, to admit of the entrance of a nut by which the pieces are brought tightly together. In the diagram the nut is shown partially turned on, it must be turned on until it fits tightly against the wood. The hole is covered with a boss ornament. The process may be reversed, the nut being let into the horizontal piece, and the bolt is then screwed into the nut until the head is brought into close contact with the hole cut in the perpendicular piece. (2) "The Amateur Mechanic's Workshop" is published by Trübner & Co., *Ludgate Hill*. Its price is 6s. (3) You had better clean your varnish brush in turpentine, and afterwards wash it in hot soap and water, rinsing it in clean warm water. Persons who are constantly using varnish keep their brushes plunged in varnish just up to the binding. I know no other medium in which they can be kept. (4) Soak the hardened varnish brush in turpentine, or try the effect of Rendle's "Electric Paint Remover," as a softener.

Self-Acting Fountain.

H. S. writes:—I wish to say that I have bought a Self-Acting Fountain by Rushton, as advertised, or rather mentioned, in AMATEUR WORK a little time back, and am very pleased with it. It is all the maker said of it, and I consider it very cheap.

Hire System for Lathes.

W. H. D. N. (*Finsbury Park*) is thanked for his letter describing the system adopted by Mr. Goy, 21 & 22, *Leadenhall Street*, and 54, *Lime Street, London, E.C.*, for supplying lathes, bicycles, tricycles, boats, canoes, and other articles too numerous to mention for easy payments extending over twelve months. Readers interested in this matter should send to Mr. Goy for his catalogue, in which the details of his system are given at length.

How to Build an Aviary.

T. D. (*Bridlington Quay*).—Full instructions on this subject will be given in an early Part.

Paper Canoe.

H. S.—In building your paper canoe it will be better to damp the paper before laying it on. Instructions for making an improved Zoetrope must be deferred for the present, as I have so many papers on hand.

Damp through Tiles.

T.W.T. (*Lewisham*).—To prevent the damp from rising through the tiles that form the floor of your shed, take them up and relay them on a bed of concrete about 3 or 4 inches thick. Damp cannot rise through the concrete, and your tiled floor would always be dry in the wettest of weather.

Cheap Alembic, or Still.

J. G. M. (*Dalry*).—Messrs. Griffin & Co., *Garrick Street*, supply cheap stills for amateurs. Directions for making a cheap still for distilling water were given in Part III. of AMATEUR WORK, in the third of the series of papers on "Electro-plating at Home," by Mr. Edwinson.

Cutting Mounts for Pictures.

H. M. C. T. (*Blackburn*).—I am sorry that you have been disappointed in not receiving an earlier answer to your query; but if my memory does not deceive me, I think it has been already answered. Instructions on cutting and preparing mounts will be given very shortly. Instructions for making a washing-stand, have been given in Strong and Simple Home-made Furniture, by Mark Mallett.

Gutta Percha Cement.

J. B. (*Rochdale*) is advised to dissolve the gutta percha scraps in bisulphide of carbon until a dark thick syrupy mass has been obtained. Keep this in a bottle stoppered with a glass stopper, tied securely down. Use: to cement leather to wood, or leather to other substances in damp situations; also to cement gutta percha surfaces. Apply quickly with a stiff brush, and stopper the cement bottle again at once. The solvent soon evaporates and leaves a thin film of gutta percha between the joints.

Brown Cement.

J. T. F. (*Brixton*).—The cement described in reply to J. B. would be brown and waterproof.

Dissolving India Rubber.

X. Q. Z.—The best solvents for India-rubber are bisulphide of carbon and chloroform. Next them come benzole (not benzoline or benzine), mineral naphtha, and spirits or oil of turpentine, but the last require heat and pure cut rubber to operate with.

Mounting Oleographs.

T.W. (*Kurrachee*).—The best way of mounting large oleographs for framing is to make a frame about ¼ inch larger every way than the dimensions of the picture to be mounted. On this frame stretch a piece of thin canvas or calico. Damp the material before nailing it on, and when dry you will find it as tight as a drum-head. Damp the calico again and apply some good paste to the back of the oleograph. Then lay the picture on the calico and gently press the surface with a soft cloth to exclude air-bubbles. It will present a wrinkled appearance, but as the moisture evaporates from the calico and picture the wrinkles will disappear, and the latter will be as smooth and flat as you could wish. Mr. Brion, the writer of the articles on "Relievo Maps," will shortly describe the process to be followed in mounting maps and pictures at length.

Rogers' Fret-Saw.

W. R. C. writes:—As the writer of the article on "Rogers' Fret-saw Machine," in Part 13, page 96, of your work, I would wish to call your attention to a slight error. The words "lightening the jaws" are inserted instead of "tightening the saws." [It was a printer's error. Easily made by the compositor, and as easily overlooked by the reader.—ED.]

Dale's Granule Battery.

ELECTRIFIED LAWYER.—An illustrated description of this battery, and also of a modified form of the same, is now in the Editor's hands. You expect too much from the battery, and have submitted it to a severe test with unamalgamated zincs. No wonder you experienced an abominable stench! How could you expect otherwise when you exposed unamalgamated zinc to the action of hydrochloric acid? Under such conditions the evolution of hydrogen alone would be unbearable, and when this was combined with some free chlorine gas, then, faugh, the stench must have been very disagreeable. Don't repeat the mistake, but always use amalgamated zincs, and keep from ½ oz. to ¾ oz. of mercury in the bottom of the porous cell with the zinc. Throw away the inner solution, make up some fresh solution, clean the zincs, well amalgamate them, try again and report results. Respecting your other query, allow me first to use a Cornishman's and Yankee's privilege in answering your questions by asking some of you. Would you tender advice to a client until you heard all the facts of his case? Would you advise him to undertake a suit unless you first knew whether he was able to carry it out or not? I think not, and I am placed in a similar position with you, for I do not know your abilities as a mechanic, and therefore cannot advise you to forsake the law for mechanics. My experience of life leads me to observe that it is best for a man to stick to that employment which will bring him in most bread and cheese, providing always that it is a honest and honourable employment. If you wish to improve your education in the direction of electrical science, you will do well to consult W. N. Tiddy, Esq., Secretary to the School of Telegraphy and Electrical Engineering, 12, Princes Street, Hanover Square, W.

Silvering Glass.

Chas. Johnson.—In the chemical process for silvering glass, pure silver is deposited on the glass from a strong solution of nitrate of silver, by adding to this solution (when floated on the glass) a solution of sugar and other organic matter. The nitrate of silver can be purchased from any chemist, from twopence to threepence per pennyweight.

Consuming Smoke.

J. H. L. (*Newcastle-on-Tyne*).—In reply to your enquiry how to consume the smoke from a Star Boiler, there would be very little or none. Coal should not be used, as it would coke in burning, and the fresh supply in the hopper would not fall, so the fire would go out; but small lumps of coke, with just a little coal to start the fire, and ashes should be used.

Electro-Magnetic Machine.

J. T.—This will be described in the articles on Dynamo-Electric Machines shortly to be prepared. Without a better description of your machine is forthcoming than that contained in your letter, I fear that I cannot assist you in putting it in order. Am glad to hear of your success with electric bells.

Violin-Making.

J. C. F. (*Longtown*).—Your query is touched upon on Page 168, Vol. I. The back when struck ought to yield a note higher than the belly, the difference being just—a tone. The passage in Savart saying they ought to sound in unison is an error which has misled many.

W. E. L. (*Crosby*).—Your idea of making a fiddle of gutta percha is, I should think, sufficiently argued against on p. 505, Vol. I.

J. H. R. (*Halstead*).—Vide the present and future chapters.

J. G. L. (*Norfolk*).—If you will read the chapters on varnishing, pages 309 to 313, and 345 to 348, Vol. I, you will see that your query is made without a knowledge of the actual processes. The *colour* of a violin is in the *varnish*, *not* on the wood. You complain that you cannot size without sending 120 miles for materials. Your only remedy is to come and live nearer unto them that sell.

Enthusiast.—You will find your queries answered and your suggestions carried out in the present and forthcoming chapters.

Violin.—I do not think the carved headed Steiners the best. They are seldom genuine, the Albani, Klotz, Statelmann, and Withalm's all imitated him most faithfully, and their instruments are often sold for his. The carved head is no more a guarantee that the fiddle is by Steiner, than a coronet on a cab proves that the occupant is a duke. Steiners at their zenith, *i.e.*, about 1800, were worth from £60 to £150; £40 is now a long price for the best. The older and better seasoned a sound-post is, the better it is, *provided* it has not warped or contracted so as to be too short, a circumstance which can only be detected by the failing of the tone, vide page 210, Vol. I.

J. F. M. (*Carlisle*).—I do not know of any good violins going cheap. *I am not a dealer.* Go to Mr. Hill, of Wardour Street, or some other trader, if you want an instrument. I cannot be worried by such matters.

Electric Clock.

T. J. O. C.—I will give my attention to the subject and prepare the information required by you. I shall have to make some drawings to render all clear and the article complete, this will take up some time, but the work shall not be delayed more than will be found necessary to execute them. You are thanked for your kindly interest in Amateur Work, and your efforts to increase its circulation.

Electro-Gilding Solution.

E. V.—The best method for an amateur is as follows: Dissolve $\frac{1}{2}$ oz. best cyanide of potassium in one pint of distilled water heated to 150° Fahr. in an enamelled saucepan. In this hang a strip of pure gold suspended to a platinum wire, and also suspend another platinum wire in the solution. Connect this last to the zinc of a battery, and the wire from the gold to the copper of a battery. Pass a current until a piece of German silver will gild when held to the platinum wire, and keep up the heat to 150° Fahr. whilst working the solution.

Electro-Magnet.

W. S. Brown.—The full effect to be obtained from electro-magnets wound with a given size of wire is not well known, but the following hints may be of some service to you in developing the full power in yours. Suppose we take your No. 22 silk-covered wire and wind it on your $\frac{1}{2}$ inch magnet. Let me tell you, in passing, that the wire should be wound on a thin wood bobbin or on shellac baked on the legs of the magnet, and it must be wound as directed for bell magnets on page 323, or on page 495, Vol. I. With two cells of a battery and three layers of wire on each leg of the magnet, it lifts, say, 2 pounds through $\frac{1}{4}$ an inch, put on more layers and it will lift a heavier weight through more space; increase the number of layers until the magnet appears to have lost strength, then add another cell to the battery, or two more cells, and you will have a powerful magnet. There will be no advantage in winding the wire on the bend of the magnet, but pile it up in even layers on the legs of it as much as you like.

Electro-Plating.

J. M. L.—Your letter did not reach me in time to allow of a reply appearing in the January part. A nickel plated bicycle should not show rust spots through the coat of nickel if this is put on well and is of a proper thickness. I do not think you will gain anything by the proposed change, since silver does not wear nearly as well as nickle and is far more costly than the latter metal. You cannot deposit silver on steel direct, it must be first coppered in an alkaline copper solution. You must consult your own interests, and decide whether or not it will pay you to set up a plating plant of your own. I can furnish you with an estimate of cost if you will give me the size of the largest article you are likely to plate; but I must warn you against doing it in the house or near the sleeping apartments of children or servants, for the fumes likely to arise are most pernicious and poisonous, and should be conveyed away from a properly ventilated workshop.

Electric Bells.

R. L. O. B.—Figure 4 in the last column of the Morse Telegraph Code on page 74, is not correctly printed. The signal should be made with four short strokes and one long stroke, and should have been printed thus, 4 . . . . —. Readers can easily correct the mistake by putting in the dot with a pen, as I have done in my copy. Thanks for calling attention to the error.

Secondary or Storage Batteries.

A Bothered One.—The Sellon-Volckmar cell is deemed the best of those named by you, but you should know that this and also the Faure cell is protected by patents. I shall have something to say about storage batteries and their adaptations to the wants of amateurs, in a short article, the subject being too lengthy to be dealt with in these columns.

Matches that Light only on the Box.

N. A. R.—The process for making those matches is one outside the province of the amateur. I have known it attempted, but never with success.

Soldering Mixture.

J. H. W. (*Galley Gate, York*), writes:—I forward a recipe, which I recommend to all who intend soldering. I have used it for years, and I can always get my solder to *run well*. Four oz. spirits of salts costs 2d.; 1 oz. of rock sal-ammoniac costs 2d. Put the two in a jar, as a bottle is liable to break, and then add zinc clippings until it ceases to boil.

Photography.

J. H. W. (*Galley Gate, York*) writes:—I am very pleased to see papers on dry plates n Photography, and I advise every amateur to get "The Year-Book on Photography," by Piper and Carter.

INFORMATION SOUGHT.

Metal Tubes for Colours.

F. V. R (*Witham*) writes:—Will you kindly tell me where I can get empty metal tubes, similar to those into which oil colours are put for painting in oils.

Music Engravers' Tools.

E. R. S. (*Portland Place*) writes:—I am anxious to find out where I can buy music engravers' tools, and the plates (zinc or pewter, or some such metal) on which they engrave.

Anemometers.

B. V. writes:—I should be glad of some information on anemometers. I think if someone would give some papers on "Meteorological Instruments," it would be acceptable to many of your subscribers.

Fittings for Cabinet-work.

Musjice writes:—I shall feel greatly obliged if you can give me the address of a tradesman able to supply miniature ornamental hinges, handles, locks, fastenings, etc., etc., in brass and white metal, for use in making such small things as pipe racks of different patterns, and many other little things.

Waterproofing Uppers of Boots.

POLICE-CONSTABLE writes:—Being one of the numerous subscribers to your valuable journal, and in common with many of a like profession, viz., that of police constables, much exposed to the inclemency of the weather, I write to ask if you will kindly assist us in endeavouring to obtain the following information:—viz., How to procure a solution of india-rubber, which may be applied to the uppers of our boots, etc., so as to render them waterproof; also, where to obtain the requisite ingredients? [Have you tried "Millen's Snow and Wet Repeller, and Sole Protector," for soles and uppers; sent, post free, for 1s., by Humphrey Millen, Fern Factory, Little Marlow, Bucks? If you have not yet done so, and you put this preparation to the test, please report on it.—ED.]

Truing Grindstone.

DELTA asks:—What is the best plan for truing the face of a grindstone which has become worn and hollow in places? Diameter of wheel about 2 feet. [See "Wood-Working Machinery for Amateurs" in this Part.—ED.]

Ballasting and Canvassing Yachts.

DELTA asks:—Would it be possible for you to insert in your magazine, a paper, or papers, on the subject of ballasting and canvassing sea-going cutter yachts of a moderate size (say, 5 to 10 tons)? I don't want you to treat of sail-making, but merely of draughting sails, and of proportioning the ballast and canvas to the size of the vessel, and to each other. I am sure this information would be useful to many of your yachting readers, who, like myself, cannot afford to get their sails draughted by a professional.

Indian Clubs.

CORNET wishes to know how to make a pair of Indian clubs; also, the cost, and the weight for a youth of eighteen years.

Browning Guns.

GUN-BARREL asks:—Will anyone give me a good recipe or formula for browning guns?

Silvering Mirrors.

W. C. (*Alfreton*) writes:—I had heard of the cheap process of making mirrors some two years ago, but could not obtain the particulars until I read them on page 476 of AMATEUR WORK. The quantities of the ingredients, however, are not given. It appears to me that the silvering of mirrors is quite within the compass of an intelligent amateur, and I for one would be glad to have any further instructions you may be able to give in the matter. Perhaps some of your readers are already practised in this matter, and will communicate an article.

Stringing Lawn Tennis Bats.

E. P. H. (*Surbiton*) asks:—Could you give us a short article on "Stringing Lawn Tennis Bats?" I think it would be beneficial to the lawn tennis playing portion of the readers of AMATEUR WORK. Also an article on putting up circular saws or fixing them to a lathe. I have a saw, but no other part of one. [This subject is in hand.—ED.]

Japanning Tea Canisters, etc.

COUNTER-JUMPER writes:—Can you tell me, through the medium of AMATEUR WORK, how to enamel old tea canisters, or rather, re-enamel them, black with a gold stripe, about an inch wide top and bottom? Also, if you can, in an early number, give me (and, no doubt, many others) the benefit of a design, simple but neat, for counter and fittings, suitable for a grocer's shop, such as an amateur who has got about all his knowledge of tools from your admirable work, "Every Man His own Mechanic," and who is benefiting by your boon to the public—AMATEUR WORK—could make in spare hours. I am only a poor man, who hopes to enter business as a grocer for myself at some future time, and having been very successful in making many articles from your designs in AMATEUR WORK, I thought I should like to try my hand at some fittings, if you could afford me space. [It is not an easy matter to supply suggestions and designs for shop fittings without a *plan* of the shop itself. Send this, and you shall have help in the matter.—ED.]

Gold and Silver Frosting.

H. L. (*Hull*) would be glad if any reader could inform him by what means gold and silver are made to have a frosted appearance, and if the same means are used for gilt and plated work?

Glass Engraver's Lathe.

F. C. G. writes:—Kindly let me know where I can get a glass engraver's lathe and copper wheels.

Model Engine Making.

SIGMA writes:—Will Mr. Fernley give us some more papers on "Model Engine Making," and the names of some text-books on mechanics' model engines principally? also, the calculating point, such as finding horse-power, etc.

Writing Desk.

J. L. (*Liverpool*) wants to know how to make a fairly-good writing-desk, and the materials necessary. I should be very much obliged if you could give me instructions to make one, say about 20 inches long, 14 inches broad, and 7 inches deep. I would like it to have three or four small drawers (one or two *secret*), a place for ink, pens, etc., also one for writing-paper, envelopes, etc.; the desk to close with a secret catch instead of a lock and key.

Tuning Concertina.

CONSTANT READER asks:—Will you kindly give instructions for tuning a German concertina? I mean, how to put a new brass reed or tongue in, so as to get the right sound.

Tongues for Concertinas.

J. H. W. (*Galley Gate, York*) asks where he can get tongues for concertinas, and adds:—"I shall be glad to see papers on Reed Organs, when it is convenient."

Cleaning Shells.

H. D. E asks:—Can you inform me of a cement that will strongly join shells—in making ornaments? also, what is the best acid to use in cleaning shells.

Cork Cutting.

J. H. asks for the names of tools used, and directions, for cork cutting.

Daylight Reflector.

W. C. C. (*Richmond*) writes:—I should be glad if any of your numerous readers, or clever contributors, could suggest an inexpensive mode of making a daylight reflector to be suspended outside a window.

Plates for Anastatic Ink Process.

ETCHER asks:—Will any reader kindly explain, through AMATEUR WORK, the process by which the zinc plates are prepared for printing by the Anastatic Ink Process?

Reviver for Gilt Frames.

H. E. L. P. (*Killiney*) asks:—How can I clean picture frames, both in English oil gilding and in Florence water ditto? I had a bottle which did the former perfectly, but have been unable to get it, as the person who sold it in London has left. The address is no use, and though I tried at many druggists, I could not get "the Reviver." I do not know what can be done for the bright water gilding of Florence; can anyone tell me? I have many picture frames in good condition, if I could freshen them up. The information would be useful to many readers.

INFORMATION SUPPLIED.

Pianoforte Tuning.

J. W. C. (*Brixton*) writes:—I have just seen the new part of AMATEUR WORK, and amongst other things in it, the suggestion of your correspondent on "Pianoforte Tuning." I fancy he must be a happy Arcadian in respect of being the unconscious possessor of some musical notions. It is well known that many very fair tuners have not had a musical education or training, but it is quite impossible that they can tune properly without some musical knowledge, though this may be of a strictly limited kind. This knowledge may be, and there is but little doubt is, as a rule, "picked up," or acquired without effort, just as knowledge is acquired of parts of many subjects, with other parts of which one's studies are associated. Your correspondent is quite wrong in stating that tuning—if by that he means practical tuning—is *solely* a matter of mechanical vibration. It is so, largely, but essentially it is a matter of musical interval, and this is a relative matter. I should like to see the man who would say absolutely and correctly whether a given chord when struck is giving 514 or 522 vibrations in a second. Mr. ——, a practical tuner, has a musical knowledge of accuracy in intervals—if not otherwise—at all events, by association and by hearing intervals in played or sung music; and for this he *must have an ear naturally or trained to be capable of* appreciating accuracy of interval whether absolute or tempered.

Corners for Picture Frames.

H. C. (*Plumstead*) writes in reply to SHREMUS, that he may obtain what he requires at Messrs. Dexheimer Brothers, *Charlotte Street, Fitzroy Square*, if, as he states, he wants metal corners; but the or-

naments for picture frames are usually of composition, and would be obtainable at Messrs. Harwitz and Sorm, 58, *City Road, London*.

Fret-sawing from Designs in "Amateur Work."

W. W. (*Battersea*) writes:—In answer to Bric a Brac, I am willing to make him any article he requires, and also to give him an estimate of the cost, but he must bear in mind that he will not be able to get any article made by a joiner at the price he sees furniture offered for in shop windows. An article made by a good joiner will last for ages, which is more than can be said for cheap furniture.

E. M. (*Southampton*) writes:—Seeing that H. J. N. (*Bishop's Castle*) requires the name of some person to execute fretwork patterns for him, I beg to forward mine, and also a rough piece of fretting. [The specimen of fret-cutting forwarded is very fairly executed.—Ed.]

T. A. D. (*Yardley Hastings*) writes:—I see that H. J. N. (*Bishop's Castle*) wishes to obtain the address of some person who will do some fret-saw work for him. I think that I could do some for him, if his terms are suitable.

Engraving on Glass.

Politzer writes:—The best tool for this purpose is the diamond spark tool, and which could be obtained about three years ago from G. Roberts, 30, *Byford Street, Liverpool*. The price would be about 3s., but I would suggest as being the easiest for an amateur, to use fluoric acid, a small bottle of which would cost 1s. 6d., with instructions for use; but I would add a caution in its use: do not let it come in contact with your flesh, as the burn or wound from it is very difficult to heal.

W. A. de B. (*Finsbury Park*) writes:—In answer to Etching, may I be allowed to state that Townsend & Mercer's, 89, *Bishopsgate Street Within, London, E.C.*, manufacturing chemists, sell bottles of some chemical, price 1s. 6d., that engraves on glass, an ordinary pen only being wanted.

Phonograph.

Politzer writes:—I should advise the inquirer on this subject to purchase from Ward, Lock, & Co., for 1s., the book, "All about the Telephone and Phonograph." As the making of a Phonograph involves the use of a lathe to turn up the cylinder and spindle, and to cut a thread on same, which would be difficult for anyone unacquainted with the use of a lathe. If, however, after reading the book, he wishes to go on, I will give him instructions.

Cutting off Bottoms of Bottles.

C. M. (*Willesden*) may get the bottom off his bottle by pouring water in to the depth of half an inch, and then stand it on hob close to the fire, or put it in the oven when the latter is very hot, it will take the bottom off as clean as a whistle. When I was a boy, and had the electrical mania very badly, I cut the bottoms off several bottles for a cylinder machine, electroscope, etc., by filing the outer face of the bottle through with a three-corner saw file, and then giving the bottom a tap, knocking it clean off, and then grinding the edges with sand and water in the wash-house sink. [From a Pro.]

C. M. (*Willesden*).—See reply to L. B.

Cutting off Top of Chimney Lamp.

L. B.—Tie a piece of string around the chimney just where you want to cut it off. Draw a sharp file around the glass close to the string, so as to mark the glass with a deep scratch. Draw a red-hot iron around in the track of the scratch, or moisten the string with spirits of turpentine, and set it on fire. The sudden application of heat will make the glass crack in the line of the scratch. I have frequently cut tubes of annealed glass in a similar manner.

R. F. R. B. (*Oxford*) writes:—In answer to L. B, the best way to crack glass lamp chimneys is to tie round the glass at the place at which it is wished to crack it a piece of thick knitting cotton, saturated with spirits of wine. Set this on fire, and hold the chimney on one side, so that the flame only heats that portion of the glass round which the cotton is tied. When the spirits of wine has nearly burnt out dip the glass suddenly into a basin of cold water, so that the level of the water comes up to the heated place. The cold water causes the glass to contract at the heated place, and, as it does not contract above the level of the water, a crack is made all round the glass, and the top easily breaks off. This plan generally succeeds beautifully, the glass cracking off as evenly as possible. I speak from experience, as I always crack my own lamp chimneys in this way. C. M. can get the bottom off the glass bottle in the same way, but it is not so easily done as the lamp chimney is. Knitting cotton is best, as it absorbs more of the spirits.

Books on Organ Building.

G. H. (*Hackney*) writes:—In reply to J. H. M., who asks for information as to books on organ building, I beg to inform him that there is a capital book on the subject, published in Weale's Series, the title of the work is "Practical Organ Building," by W. E. Dickson, M.A., Precentor of Ely Cathedral. Illustrated, price 2s. 6d. I can strongly recommend this work. [This book has been noticed in "Notes and Novelties"—Ed.]

L. writes:—In answer to J. H. M., there are only two books on the organ that I have been able to find out: one by Hopkins, and another by Edwards, which I think is the best, for it gives as much information on building as the other, and is much cheaper. All the books and papers on organ building are very defective on the most important point, namely, voicing.

Electricity as a Means of Cure.

J. Tester (83, *Livingstone Road, West Brighton*) writes:—If Sufferer and Christian will write, I shall be pleased to give them information respecting application of electricity, diet, etc. I shall be pleased at all times to give readers of the journal advice respecting application of electricity. In diseases of any kind, electricity alone will not cure, but electricity, water, diet, and rest will.

Writing Ink for Tickets.

F. R. (*Pimlico*).—*Black*—Lampblack, drop black, Indian ink, or other black pigment ground up in a thick solution of gum arabic. *Red Ink*—Moist water-colour of the required tint ground in a thick solution of gum arabic.

F. J. K. (*Clapham Junction*) writes:—In answer to F. R. (*Pimlico*), asking how to make a cheap writing ink for tickets, if he put gum arabic in common writing-ink (about 2 oz. to the half pint), and place it in the oven till dissolved, he will get a good ink that will dry quite glossy and bright. For coloured inks white gum must be used. To keep the ink good a few cloves should be added. I have used the above ink for years, and always found it better than any I could buy.

R. F. R. B. (*Oxford*) writes:—In answer to F. R., a very good permanent black ink may be made by reducing to powder a cake of Indian ink, and rubbing it up to a thin paste with glycerine. When mixed it may be diluted to the required strength with water. This makes a capital ink, jet black, and very strong. The only objection to it is the long time it takes to dry. If, however, the writing is held in front of the fire, it very soon dries. It may be blotted in the ordinary way, but drying it before a fire is best, as it does not remove any of the ink.

Bleaching Coral.

Politzer writes:—Apply a mixture of hydrochloric acid (spirits of salts) and water, or wash the coral with a stiff brush in cold salt and water, with a little soap powder, a little chloride of lime will improve it, then put in the sun to dry and bleach.

W. G. writes:—In answer to W. J. (*Bristol*), "How to Bleach Coral," allow me to inform him of the following method: Suspend the mass to be cleansed, upside down, by means of a piece of wire, in a saucepan nearly full of water, so that the dirt will drip into the water; boil for not less than three hours, having previously put plenty of ordinary washing powder or oxalic acid (poison) in the water.

C. writes:—Your correspondent, W. J. (*Bristol*), asks for a recipe for bleaching coral. I have found washing it in *sea water*, and standing it in the sun to dry, to do well. If the coral is once touched with fresh water, I believe it will be hopeless work.

R. A. R. B. writes:—In answer to W. J. (*Bristol*), I send you the following recipe for cleaning coral, from the "Boy's Own Paper," Vol. IV., page 808. "The secret in cleaning coral is to turn the mass bottom upwards and suspend it by means of a piece of wire in the saucepan, so that the dirt, as it boils off, may drop into the water, instead of down the septa." A strong solution of ordinary washing soda, or better, oxalic acid, is to be used to boil it in. The mass is to be boiled for at least three hours. This is not only to *clean* the coral but to *bleach* it also.

ARTISTIC MODELLING AND AMATEUR SCULPTURE.

By MARK MALLETT.

II.—Practice from the Cast and from the Flat—Working from Life—Modelling Busts and Medallions—Sketching in Clay—Ideal Sculpture, and Modelling Figures in the Round.

PRACTICE *from the Cast and from the Flat.*—Should time, and the patience of the amateur modeller serve, he will do well to make several studies, on a large scale, from casts of portions of the human figure. As well as faces, large hands and feet, and more especially hands, are recommended, as things for him to copy.

In regular art-training this kind of practice is generally succeeded by making models in relief of entire figures, the nude antique statues being still the subjects of study. If the amateur will follow this course, he will find his account in so doing. It will give him a knowledge of the human figure, which cannot fail to be of great value to him in his future art.

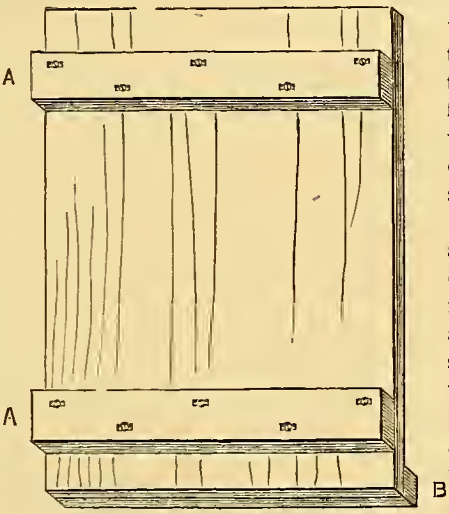


FIG. 3.—BOARD FOR RELIEF MOULDING. BACK VIEW.

In schools of art life-sized casts of some of the most admired antique statues are always provided for the use of the student. Our amateur, who will probably have to work at home and alone, cannot provide himself with such cumbrous luxuries; but small copies of most of the best figures are to be bought at the plaster shops, for two or three shillings each, and these will serve his purpose.

To support such a relief a board will have to be provided, some 30 inches or 3 feet high. In Fig. 3 I give an illustration of such a board; any one can put it together. The view is a back one, for the sake of showing the manner in which the ledges A A are attached.

These ledges are to strengthen the board and keep it from warping; and that neither they nor the board may split with the swelling consequent on covering the wood with wet clay, the screws with which they are fastened are let through slits (as shown) instead of round holes. By this arrangement expansion and contraction are rendered harmless. The ledge B, at the bottom of the board to the front, is fastened on in the same manner. Its use is to support the weight of the model, and prevent it from slipping from the board.

A slate background, notwithstanding its advantages as not being liable to warp, is not good for working on in very low relief. Where the clay is very thin it is hard to keep it in a proper state of dampness, and when dry it will curl up and chip from the slate. Moreover, in very low relief, the modeller sometimes finds it necessary to dig a little into the background to increase the effect; and if the background is slate this cannot be done.

For our purpose, the board, overlaid with a level background of clay, is superior. First, damping the wood with a sponge, we lay a coating of clay all over its face, from three-quarters to an inch in thickness. This we scrape and smooth down with the serrated straight-edge till it is tolerably level. It should then be left uncovered for twenty-four hours that it may set, after which it must again be gone over with the straight-edge, and scraped till perfectly true.

Studies of the kind proposed are generally made 2 feet high, or a little higher. It is by submitting such things to the Council as specimens of their skill, that students in sculpture are admitted to the Royal Academy; and the above is the minimum height allowed. Before resolving on what view of our statue we wil take, it will be well to consider in which of its aspects it will best compose as a work in relief—that is to say, on which side will it best show its motive and action—its limbs form the most agreeable lines—and no arm or leg stick straight out towards us, demanding foreshortening, which is a difficult thing to manage satisfactorily in sculpture.

Having decided this point, we begin to sketch in our figure on the slab of clay with a pointed tool proceeding in much the same manner as with charcoal or blacklead on a sheet of paper, using the plummet, and taking occasional measurements when necessary.

As regards measurements, however, I may observe that the better practice is to draw what is before you from the eye alone, and then to check-off, and correct what you have done by measuring. This disciplines the eye, and presently renders it so correct as to be able to dispense with measurements altogether.

It is now time for us to decide whether our work

is to be in high, low, or middle relief; and we may build up the model accordingly. But, before doing so, the student should be warned that he will avoid much after labour by sketching the outline of his figure on the background, carefully and accurately. Whilst building up, care must be taken to keep all the parts in correct relative projection, and that they are so may be ascertained by occasionally looking at the cast in the profile, and testing its forms with the plummet.

Still, with all our care, we may sometimes find, when the work is near completion, that the head or a limb is not in the right place. If so, we have not, as in drawing, to rub it out and begin again. We can cut down behind it with a piece of thin string or wire, and separate it from the background. We can then move it to right or left, if that should be the alteration required ; or, if it is too prominent, we can cut a slice from behind, and send it back; or, if it projects too little, we can build clay behind it, so as to bring it forward as far as may be desired. Such are some of the dodges at the modeller's command.

In choosing a statue from which to make a study, a male figure is rather to be preferred. It affords more useful practice, and is more easily copied. This I say under the supposition that time for this kind of practice is limited. If the student has leisure, the female figure should not be neglected, but it should not come first. The male is more useful, because it shows the anatomical structure more clearly. In it the muscular development is distinctly made out ; whilst in the female, if beautiful, everything is smoothed and rounded off by a cushion of fat beneath the skin.

The male figure is most easy, because the forms are comparatively angular, easily understood, and well-defined ; whereas the characteristic grace of the female form depends on such subtle curves as demand a practised eye and hand to reproduce them.

If at this point of his study the amateur can acquire some little knowledge of anatomy, he will find it of use to him in understanding and therefore in properly representing the forms which he sees in the cast; and of still greater value by-and-by when he is working from the life, or from imagination. His better plan will be to buy an anatomical figure, that is, a cast of the human figure from which the skin and external fat have been removed, and the outer layer of muscles exposed. Such figures are to be bought at the plaster shops from 1s. 6d. upwards. With one of these, and a small handbook of artistic anatomy, of which plenty are published, it will be easy to learn the names, situations, and uses of the chief external muscles. For the amateur's purpose, any profound study of anatomy would be superfluous.

So much knowledge and skill will by this time have been gained, that the student may engage in another kind of practice, which he will find exceedingly interesting, as it will have something of the charm of originality, and be of value when done. This is modelling from the "flat," modelling that is, from prints, or photographs.

His recent practice from the "round," will have taught the student what subjects in the flat are suited for reproduction in sculpture, and also the way in which to bring out their different parts in proper comparative relief.

Working from Life, Modelling a Bust.—Before the modeller can begin his actual work upon a bust, some little mechanical arrangement will be necessary for its support. Fig. 4 shows such a frame. Its base should be of nearly the same size as the top of the modelling stool on which it will have to stand ; and into the centre of this is mortised an upright, some two feet high. The tenon at bottom of the upright passes through the base, and is tightened and secured below by a peg. This is to permit of the frame being readily taken to pieces when the bust has been surrounded with a plaster mould (see "Casting in Plaster," p. 388, Vol. I.). After the mould has been formed, this peg can be knocked out, and the base removed, which will allow the operator to get at and scoop away the clay from within.

The cross-piece near the top of the upright, which serves to support the weight of the clay, forming the the head of the bust, is also tapered and thrust through a mortise hole, that it may likewise be readily taken apart, and thus permit the upright to be withdrawn through the neck of the mould. The ledges beneath are better screwed on in the same manner as those of the modelling board, Fig. 3.

Such a frame is easily put together, and I should advise that it be made of deal. Some other woods when kept damp for a long while, as they must be when enclosed in a model, are apt to produce a mouldy, fungoid growth in the clay. Models in England are not liable to suffer from this kind of thing to the same extent that they do in the warmer climate of Italy; but all such matters are disagreeable, and best avoided.

It is well to build up a bust two or three days before the first sitting; for, as it will take something like half a hundredweight of clay, not less time will be required for it so far to set and become firm as to be in a good state to work upon. Of course, during this time it should be left uncovered. The bust, when thus roughed-in, need be only the rudest resemblance of the human form, the head being more like a barber's block, and the whole smaller and thinner than the proportions of the future sitter. The upright

of the frame should be kept, as nearly as possible, at the centre of the neck; but wood has this advantage over metal for this purpose, that if, in the course of future alterations, its edge should crop-up to the surface, it is easily cut away with a chisel.

When the sitter arrives, he should be so seated as to bring his head on a level with that of the bust, and both these should, as nearly as possible, be on a level with that of the worker. Sculptors, like other artists, commonly have a platform, called a "throne," on which to seat their sitters. This contrivance, runs on casters, is four or five feet square, from one to two feet high, and is generally covered with baize. It would be found useful, and may be made from an old packing-case.

Bust and sitter should so be placed, that the light may fall upon both from the same direction and at the same angle.

Many persons have some characteristic way of carrying the head—erect, stooped, or inclined to one side or the other. If the sitter has any such peculiarity, it is one of the first things to be attended to in the clay, since later on, to alter the entire position of the head would involve much waste of labour.

Sir Francis Chantrey, whose name holds a first place as a modeller of portrait busts, is said by Cunningham to have attached so much importance to the preservation of this characteristic pose, that he was accustomed to invite his sitters to breakfast with him, before he began work, that he might observe while the object of his observations was unsuspecting and therefore unconstrained.

Apart from the above consideration, it may be observed that unless there are reasons for giving a stiff, formal character to the bust, it is not well to show the face set directly forward; a slight turn towards one side or the other adds greatly to the ease and life-like appearance of the portrait.

The method of proceeding in working from the life is much the same as that in working from the cast, the leading features and general proportions have first to be got in, and in the first sitting there will be little time for detail. At this stage it is well to use the callipers freely, so as to make sure of the actual proportions. In working from the life, however, the modeller cannot proceed so leisurely as in his former practice. Whilst his sitter is before him he must bestir himself, and make the most of his opportunity. Two hours is about the right limit to allow to a sitting. If it is made longer the sitter becomes weary, and assumes an expression which it is not desirable to transfer to the bust; and two hours is as long as any modeller, if he works as he should do, can be expected to work without rest. Modelling from the life causes a severe strain on eye, brain, and nervous system, and bad work will be the result of carrying it on too long at a stretch. From four to six of such sittings will usually suffice for completing a bust.

The sitting over, much will be found necessary to be done to the model before the sitter again appears. In the hurry and excitement of working from the life, much will have been left rough and crude, which can now be smoothed down and made shapely. Moreover, if the modeller has good photographs of his sitter, he will find that much detail can be supplied from them, and thus put in at leisure.

During the earlier sittings, it is best to leave the hair expressed by merely a few bold touches, which will indicate something of its general effect. To attempt to carry it on gradually towards completion, like other parts, would be but labour lost, for each time that the sitter comes, its arrangement will be seen to have changed. The better plan is, when other parts have been tolerably brought into shape, to give a sitting specially to the hair. The whole can thus be modelled in at once, whilst the arrangement remains unaltered. What mere finish is required can be added afterwards, in the absence of the sitter.

In the antique statues little attempt was made to give the texture or natural effect of hair. Commonly, certain formal lumps and markings rather signified than represented it. Modern sculptors, however, affect its imitation, and often with good result. In models in the round, such as our bust, the assimilation of the hair to nature can only result from bold and free handling. For this treatment the clay ought to be soft and plastic. A wooden tool, and not the thumb, must be used, and the clay must be left crisp from the tool marks, and not softened down.

The question of how it will be best to drape a bust is often a perplexing one. The sculptors of last century, and of the early part of the present, scorned the dress of their own times. In one of his famous "Discourses," Sir Joshua Reynolds exhausts much weight of argument and grace of style to prove that modern costume is altogether beneath the dignity of sculpture. Yet even the ablest arguments of the ablest critics will not in the long run prevail against common sense. To deny to the portrait of a modern Englishman his accustomed dress, and to give him that of an ancient Roman, was too absurd a fashion to last. People could not but see that in most cases the usual dress adds greatly to the resemblance, and therefore to the value of the likeness; and thus, in our time, our ordinary costume has become a thing of frequent use in portrait sculpture.

That modern dress is stiff and ugly, if clumsily treated, is not to be denied, but that, if properly managed, it can be made artistic, is to be seen in such works as Mr. Woolner's well-known bust of the

laureate. Still, the difficulty of treating it well is often so great, that good sculptors of the present day sometimes shirk it, by simply throwing a piece of loose drapery round the shoulders ; or if the bust is intended to be of a formal character, by leaving it altogether nude.

The stiffness of modern coats and waistcoats may often be relieved by the introduction of such things as an academic gown, if the sitter is entitled to wear one—a cloak, or even a dressing-robe. The every-day dress, when used, should be modelled from the sitter, and it will be well to devote a special sitting to that purpose ; but loose drapery, either partly to hide or to take its place, will be better modelled in his absence. Loose drapery can hardly be taken by chance ; it must be arranged in such folds and lines as compose artistically, and please the eye of the artist. Sculptors use a lay-figure, which is a life-sized doll with movable joints, for the arrangement of their drapery. When once properly placed on the lay-figure, the folds remain unaltered till their forms have been transferred to the clay. The amateur will scarcely care to buy so costly an accessory as a lay-figure, but he can make the plaster-cast of a nude bust serve as one, and upon this arrange his drapery sufficiently well for his purpose.

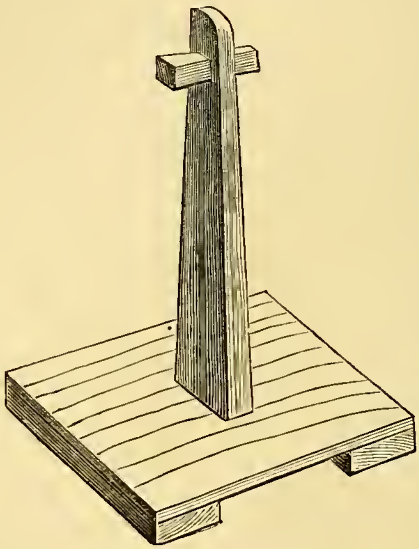


FIG. 4.—FRAME FOR MODELLING BUST.

In modelling large folds of drapery, the shorter flat tool, Fig. 1, will be found of great use ; so will the wire tool ; so will also the modelling-brush, shown in Fig. 5. Such a brush the modeller commonly makes for himself. It is easily made, and its construction is clearly shown in the back and front views. It is 5 or 6 inches long, and rather more than an inch wide ; the stiff bristles of which it is made projecting about three-quarters of an inch beyond the wooden handle. These, as shown in the illustration, are cut off quite flat at the end. Ordinary shoemaker's bristles are usec for it.

Such an instrument ought not to be put into the hands of the modeller before he has learnt to master the clay with his thumb, but in the stage of proficiency which he will now have reached, the student will find it a means of saving much time and labour. Held almost at right angles to the work, and used firmly, this tool cuts away all "humpiness," and gives a uniform surface. In drapery especially it is most valuable.

Drapery, it may be observed, looks most artistic when not smoothed down in every part, but left with brush and tool marks showing in places ; especially in the hollows, where they serve to increase the effect of shadow.

A bust may be finished square and solid at its base, which is a form well suited to some male subjects, particularly if the general treatment be stiff and severe. Thus finished, the bust will stand without further support. But more frequently, and almost always when the subject is feminine, it is usual to round off the bottom, and cast the bust hollow behind. In this case the common method is to mount it on a small round pedestal, some 5 inches high, which can be bought at the plaster shop for 1s. This requires to be fixed with liquid plaster, a slip of slate being run through its middle, and into the bust, to give strength.

A "cabinet" bust, that is a bust on a small scale, is a pretty form of portraiture, and attractive to the amateur. Busts of life-size are too large to find convenient places in all homes ; but a cabinet-bust can always find a fitting resting-place on a mantel-shelf. Before trying his hand on one of these, however, the amateur is advised to model two or three busts on the larger scale, which will be better practice, and give him a better knowledge of detail, than the small work could at first supply.

It should be remembered that if it is not as large as life, a bust should not be made to approach the dimensions of nature nearer than one half. If it does, it will look poor and mean, and look like a little head, dwarfed by accident. Less than half size, say 4 or 5 inches from chin to crown, is about the scale to be preferred.

Medallions.—In no form is portrait sculpture more fitted to find general favour than in the medallion. A medallion is much more easily and quickly executed than a bust, and, when made, is more easily shown and preserved in small houses. As regards size, most of the remarks above applied to busts are equally applicable to medallions. A work of the latter class, of the size of life, is, however, as compared with a small one, much more difficult to manage than a life-sized bust. Indeed, medallions as large or larger than life are seldom desirable, except for architectural or decorative purposes. For ordinary portraits, a head from 4 to 5 inches high (exclusive of so much of the

bust as may be shown), on a ground 13 or 14 inches in diameter, is about the best size. Though sometimes modelled in full, or three-quarter face, medallions are ordinarily most satisfactory in profile. One so shown, of the size given above, should project from background at its highest points about three-quarters of an inch.

Many persons model medallions on slate, others on slabs of plaster, cast flat for the purpose. With these the trouble of laying-in a clay background is saved, and a model on a plaster slab, owing to the absorbent nature of that material, is easily kept damp. But whatever the mechanical advantages may be, both substances, and especially the latter, are open to objection on artistic grounds. They are so different from the clay in texture and colour, as to mislead the eye in the just discrimination of light and shadow, and do not, if a highly-finished work is intended, admit of being blended with the clay in an artistic manner. It is, moreover, sometimes found desirable to indicate some slight form, as, say, of a light lock of hair, by means of a mere touch on the background itself, or even to dig a little into the background at certain points to give more shadow. With a clay background it is easy to do these things, but with one of harder material impossible.

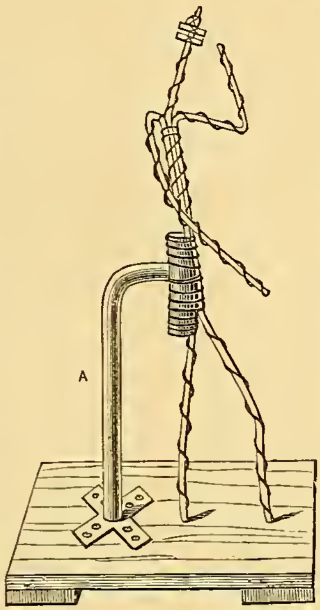


FIG. 6.—FRAMEWORK FOR FIGURE.

An easel is the best rest on which to place a medallion whilst the modeller is at work, the model and head of the sitter being kept at much the same level. It is generally found most easy to model the profile looking to the spectator's left, which is the position of the head of the Queen on coins of the present reign; and supposing this to have been the side chosen, the light should be so arranged as to fall on model and sitter somewhat from above, and from the modeller's right hand. If the face is made to look to the right, a contrary arrangement of light will be necessary. This light will best bring out the features in the relief, but as the work approaches completion, it will be desirable to turn it into different lights, that nothing may escape the eye, and be left unfinished.

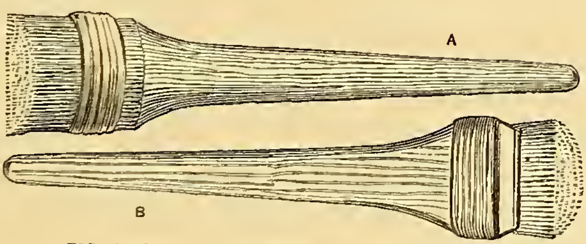


FIG. 5.—MODELLING BRUSH. A, FRONT; B, BACK.

If a pair of medallions—as, for instance, portraits of husband and wife—are executed, one should be made to look one way and one the other. Small medallions, not intended to be carried out in marble or metal, should, when cast in plaster, be framed and protected from dust by convex glasses. In order to show to best advantage, they ought to be hung in much the same light as that in which they were modelled, namely, with the back of the head towards the window.

Modelling Figures in the Round and Ideal Sculpture.—When a sculptor is about to form a large statue or group, his first step is to make a clay sketch of the subject on a small scale.

When these sketches are but a few inches high, the weight of clay is so small that they may often be built up without any supports of wood or metal; and this has two advantages: it allows of the figures and their limbs being pushed and moved freely in any direction which the artist may consider desirable to the improvement of the composition; it also allows of the sketches being preserved in the clay, if they are carefully dried and tenderly handled, for a considerable length of time. I have such sketches by me made at least fourteen years since. Clay models or sketches, it must be remembered, which have supports of metal or other foreign substances within them, are sure to crack and fall to pieces in drying, because clay shrinks very considerably with loss of moisture, whilst these substances do not shrink.

As soon as the small sketch is considered satisfactory, a skeleton or framework is set up of a size suited to the scale on which the work is to be modelled. This is of metal or wood, or a combination of the two. It will not be often that the amateur will want to model full-sized statues or groups, but an ideal work in the round, such as a statuette, will be fairly within his province. In Fig. 6 is shown a framework suitable for such a figure. The attitude of this framework is that of the well-known antique statue of Germanicus.

A is a support of iron, which, being strongly screwed to the wooden base below, enters the figure

behind at the loins; this bears the weight of the whole model. Here it ends in a short vertical bar, which crosses it at right angles, and to this pieces of leaden gas-piping are lashed with copper wire. These pieces are bound together with the wire so as to form a strong backbone for the trunk of the figure, and then branch off to form supports for the head, arms, and legs. Wire is wound about these branches throughout their whole extent, in order that the clay may hold to them more firmly. At the centre of the head two or three short crosspieces of wood are fixed, to support the mass of clay which will be placed there.

Lead or "compo" gas-piping is excellent for forming the skeletons of figures of moderate size. Its tubular form gives it a fair amount of strength. It is cheap, and easily cut and manipulated; and, chief of all its advantages, it can readily be bent whenever an alteration in the position is desired. Some persons even prefer this material to wood for the upper part of their bust-stands, and thereby reserve the power of altering the entire position of the head at will.

Life-sized or colossal figures require stronger supports, which are chiefly made of iron. Some sculptors have these made with movable joints to facilitate alterations. These matters, however, scarcely fall within the province of the amateur. Still, should he have occasion to build a large work, enough will have been said to enable him to do so without difficulty.

(*To be continued.*)

HOW TO MAKE PHOTOGRAPHIC SLIDES FOR THE MAGIC LANTERN.

(*By A DRY PLATE WORKER.*)

THE modern dry plate prepared under what is generally called the gelatine emulsion process, has effected such a revolution in the practice of photography amongst both professionals and amateurs during the last five years, that in place of the bulky and cumbersome apparatus, and the messy concoctions of silver bath, collodion, chemical solutions, etc., which were necessary for obtaining a photograph by the old *wet* process, we have now the sensitive bromide of silver plate, ready prepared for us in a convenient form, and our little portable outfit, consisting of lens, camera, and folding tripod, altogether weighing but a few pounds, with which we can sally out on any fine morning with, say, half-a-dozen dry plates, and secure half-a-dozen views, in less time than was formerly occupied in rigging up the apparatus for taking a single picture by the old process.

The extremely sensitive character of these new dry plates has also placed in our hands a new power, enabling us to secure perfect photographs of moving objects, and many a fleeting shadow as it flies. The Derby, the Boatrace, the Flying Dutchman at full speed, a flash of lightning, and even photographs by moonlight, have been obtained under the new process, which would otherwise have been impossible; the mode of development, too, so simple and cleanly that we need not even soil the fingers, can be carried out at any time when we have leisure (for the dry plate will keep, whilst the wet one will not), in our own little dark room, with all the requisites handy, instead of being hastily done in some stuffy dark tent, or a makeshift outbuilding, with all its attendant inconveniences. No wonder then, that with such advantages, the number of amateur photographers is daily increasing, and the practice of this beautiful art-science is not alone confined to a few enthusiastic gentlemen who may make it a hobby, but that ladies, too, are taking it up as an interesting and fashionable pastime, and we may add that under our own personal observation (which is not limited), we have seen some of the most artistic and beautiful productions of the camera executed by ladies.

Seeing, however, that we are not writing a treatise on the Dry Plate process, but only upon one section of it (and that a very interesting one), we must now address ourselves to the amateur, who is already initiated in the arts and mysteries of producing a good photographic negative. We will, therefore, take it for granted that the reader is in possession of the necessary appliances, and that he has during the summer season secured, in the form of negatives, some of those beautiful scenes among which he spent the pleasant days of his holiday tour, and we will now explain to him as concisely as possible one method of utilizing those negatives so that they will be a source of renewed interest to himself and of pleasure to his friends; that is, by making photographic reproductions, or *transparencies*, as they are called, for exhibiting in the magic lantern during the winter evenings.

These are produced by contact printing with an artificial light, and the requisites are: an ordinary printing frame with rather a deep rebate, the size of your negative; a developing tray made of ebonite, glass, or porcelain; a fixing dish made of porcelain or zinc; a graduated glass measure; a gaslight, preferably with a batswing burner, or a paraffin lamp; the usual non-actinic ruby lamp; the sensitive dry plates of the proper size, *i.e.*, $3\frac{1}{4}$ inches by $3\frac{1}{4}$ inches, which you can obtain specially prepared for the purpose from Messrs. Cussons and Co., 79, *Bold Street*, *Liverpool*, at about eighteenpence for one dozen packet (or probably from other makers of dry plates); and you will also require to make up the following solutions, which

are correct according to the formula issued by the makers we have named, and which have proved in our hands to give the most perfect results. Take of protosulphate of iron 1 ounce, hot water 8 ounces, let it dissolve and become cold before using (label this No. 1 solution). Take of neutral oxalate of potash 4 ounces, bromide of potassium 10 grains, hot water 1 pint, let these dissolve and become cold before using (label No. 2 solution). Take of hypo-sulphite of soda 4 ounces, water 1 pint, dissolve (label No. 3 solution). You are now ready for making the print, and for this purpose you should carefully select a good negative, fully exposed, ample in detail, and with plenty of strength and contrast between the lights and shadows. A thin delicate negative, which would yield a good print upon paper, is not so suitable for a lantern slide, since it would give only a flat and weak transparency. Having selected your negative, place it, with the varnished side upwards, in the printing frame, brush the face of it lightly over with a soft camel's-hair brush to remove any dust, then (by the light of the ruby lamp) take one of the prepared sensitive plates, 3¼ inches by 3¼ inches, carefully brush over the face, and place it, film side downwards, upon your negative in close contact, place the back of the printing frame with its springs in the usual way, and then expose the plate to the light of gas-burner, or paraffin lamp, by holding the frame in the hand about 18 inches away from the flame for about five or six seconds; the necessary exposure must be judged from the character of the negative: a little practice will soon determine this. We have given the time as an average one, but we must caution you to avoid over-exposure, the best results are always obtained with a brief exposure and long developing. As a first experiment it would be well to now complete the first plate by developing and fixing it, so as to ascertain whether the exposure has been correct; if it proves weak and thin give less exposure in future; if it proves hard and wanting in detail give a second or two longer exposure to the next plate.

The development being perhaps the most important operation in the process, great nicety and care must be exercised, that no ray of white light be allowed to fall upon the sensitized plate, as this would affect the brilliancy of the finished picture. The operation must be conducted in the dark room, under precisely the same conditions as in developing a negative; you can manipulate a number of these small transparencies together in the same tray, if of sufficient capacity, and with the Ferrous Oxalate developer this is very easy. Take, say, four of the exposed plates at a time, place them face upwards in the developing tray, mix together in your glass measure 1 ounce of No. 1, and 2 ounces of No. 2 solutions (as formula given), flow this solution quickly over the plates, and by a gentle, rocking motion of the tray, keep it constantly moving from side to side, you will shortly see the highest lights of the picture appear, then the half tones, and deeper shaded portions will gradually follow, let the developing action proceed as the picture increases in vigour, until when viewing it by transmitted light (*i.e.*, on holding it up in the fingers to the lamp and looking through it) every detail appears to stand out in bold relief of black and white, then the development may be stopped, the plate rinsed in cold water, and placed in the dish containing the No. 3 solution, sufficient to well cover it, and left to clear.

If on examination by transmitted light the picture should not appear sufficiently strong, the plate may be returned to the developing tray for a minute or two longer, and should the action of the developer not continue, take out the plate and immerse it in another smaller tray containing a solution of *Ferric Oxalate*, a very nice preparation made by the Platinotype Company, of Southampton Row, London, and sold in shilling bottles, with full instructions for use; this preparation has the effect of producing a yellow drab appearance of the image, acting as a kind of intensifier. When this has taken place, remove the plate, rinse it in cold water, and again immerse it in the original Ferrous Oxalate Solution, when the developing action will re-commence, and it may be continued until no further change appears, then rinse in water, and place in the clearing solution No. 3.

Over-exposure may be corrected during development by the addition of a very few drops of a solution of bromide potassium to the developer, which has the effect of restraining its action, and practically retarding the process, so that greater vigour is obtainable in the finished plate. You should always aim at producing the greatest strength in the transparency, combined with full delicacy of detail, bearing in mind that when you are exhibiting the slide in a magic lantern, it will lose something in those effects consequent upon the great enlargement of the picture as depicted upon the screen.

When the developed plate has remained in the fixing, or clearing solution, sufficiently long for the creamy appearance to be changed to brilliancy, it must be copiously washed in running water, say for ten or fifteen minutes, and then set upon its edge face outwards to dry spontaneously, on no account must artificial heat be used for this purpose.

When perfectly dry, the film must be protected by a thin coating of pale gelatine negative varnish (this may be obtained in shilling bottles from the makers of the plates), and if any touching out of spots or imperfections is necessary, that may be done before

varnishing, then slightly warm the plate from the back over a spirit lamp, or a clear fire, and deftly flow from the bottle a small quantity of the varnish in one wave over the surface of the film, returning the superfluous quantity back to the bottle from one corner of the plate, which may then be dried over a fire or a spirit lamp.

You now have the finished plate ready to make up in the usual form of a lantern slide ; this is effected by placing over the varnished side a black paper mask, with a round or square cut aperture in the centre of the regulation size, 3 inches, and over that again a plain glass the same size as the finished photograph, the edges of both must be closely bound together on every size with narrow strips of gummed black paper, and the title of the subject pasted upon one edge, when the slide is completed.

Very beautiful photographs may also be produced by this method upon opal glass (which is specially prepared for the purpose) suitable for framing as pictures, or as transparencies for window decoration, for hall lamps and many other purposes. They are also admirably adapted as a basis for artistic finishing in sepia, black and white, or in colours. The instructions here given being from practical experience, may be relied upon for securing the best results ; and we hope that the readers of AMATEUR WORK, who have good negatives by them, will find many a pleasant evening's amusement in following out this process.

FERNERIES:

HOW TO MAKE THEM AND MANAGE THEM.

By DONALD BEDE.

II.—OPEN FERNERIES WITH AQUARIUM, FOUNTAIN, ETC.—UTILIZATION OF DEAD WALLS.

THE current papers on "Soft Soldering," in AMATEUR WORK, appear opportunely for these instructions, as the designs will now be of such a character as will necessitate at least an elementary knowledge of the simple art of soldering. Moreover, as the metal work in these designs is entirely concealed from view, and will be all the better—at least none the worse—for being of the roughest possible kind, it will enable the novice to try his hand with confidence.

Fig. 8 is a glass shade fernery, the base consisting of a rustic rockwork pan, which is made by first making a zinc vessel (Fig. 9) thus : Take a piece of No. 9 or 10 sheet zinc, and strike a circle $10\frac{1}{8}$ inches in diameter, cut it to the line with a pair of shears or large scissors, then take a piece 4 inches deep and $31\frac{1}{2}$ inches long, solder this into a hoop $10\frac{1}{8}$ inches diameter, and solder this on to the circular plate ; now solder three or four ledges about $\frac{1}{2}$ inch inside the vessel, for the glass to rest upon. You will now require a glass shade 10 inches wide by 14 deep ; cover the lower part with two thicknesses of paper, and set it inside the vessel, resting on the ledges : the whole being upon a flat board or table, covered with paper.

Now to build up the rustic work : Get some gas coke, which break up into pieces about the size of walnuts, make a thin batter of Roman cement and water, and dip them in ; cement these with Roman cement on to the vessel. The vessel should be supported to a height of about 1 inch, so as to leave a hollow when finished. Use smaller pieces of coke towards the top, and use cement only at the top, as though you were actually cementing the glass in; make a neat but not perfectly straight line at the top, taking care that the lower part presents a rugged but not clumsy appearance ; when this is set firm, take out the glass, which, when the paper is removed, should fit easily. Bore a few holes in the bottom, and your fernery is complete. Colour as directed in Chapter I. This should cost about 2s.

Fig. 10 is an open fernery, with an aquarium on top, and for hardy ferns will be found to answer well. In this the zinc work will require to be rather more carefully made, as follows : Take a piece of No. 10 zinc 12 inches by 9, and roll it into the form of a tube about $2\frac{1}{2}$ inches wide; solder roughly the seam; this will give you a hollow pillar 12 inches by $2\frac{1}{2}$. Now make a zinc tray (Fig. 11) by soldering a 1 inch rim of zinc on to a 12 inch circular piece of zinc. This must be soldered so as to be water-tight, as in watering the ferns in the small pockets or recesses, this will protect the table when in use. For the aquarium glass, an 11 inch propagator glass (to be obtained at any glass-dealer's), set upside down, will answer admirably. Now build up the fernery (Fig. 12). Proceed, as in Fig 8, by arranging some good-sized pieces of coke of irregular shapes all round the tray. Now get four $3\frac{1}{2}$ inch flower-pots, and cover them with paper, and with pieces of string secure them to the pillar in a slanting position, as shown ; cement all the sides of the pots, taking care to keep below the rim, so that they can be withdrawn at a later stage. This will require about two applications of cement. Put good-sized pieces of coke between the pots, and let the rockwork be rugged, but light. When these four have been set in, and the work is firm to the touch, withdraw the pots, and finish off the edges and inside the recesses carefully. Now proceed to build up a second tier of pots in the same way, arranged as in plan, Fig. 13, and as partially shown in Fig. 12. This upper tier is built

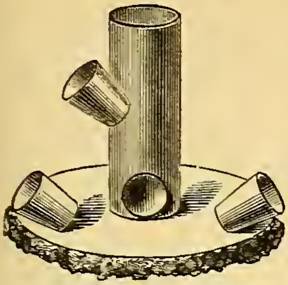


FIG. 12.—MODE OF BUILDING UP FERNERY.

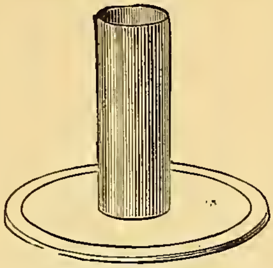


FIG. 11.—ZINC TRAY AND PILLAR FOR OPEN FERNERY.

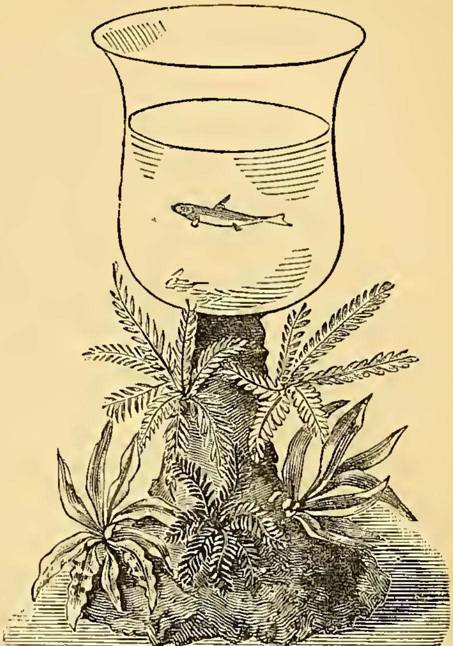


FIG. 10.—OPEN FERNERY, WITH AQUARIUM.

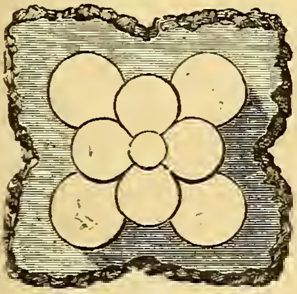


FIG. 13.—PLAN SHOWING TIERS OF POTS.

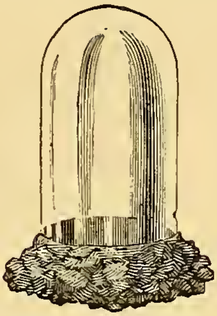


FIG. 8.—GLASS SHADE FERNERY.

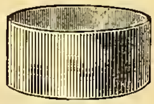


FIG. 9.—ZINC VESSEL FOR GLASS SHADE FERNERY.

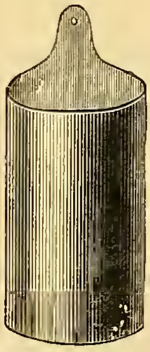


FIG. 15.—SMALL HALF-ROUND TANK.

FIG. 14.—OPEN FERNERY, AQUARIUM, AND FOUNTAIN.

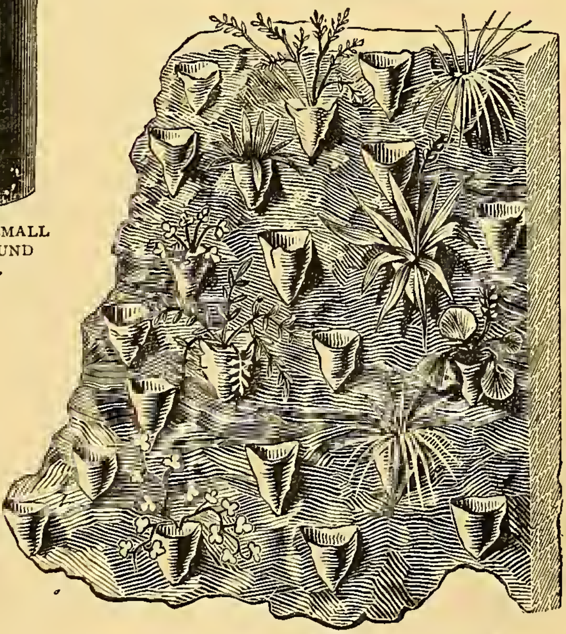


FIG. 16.—UTILIZATION OF DEAD WALLS AS FERNERY.

much closer to the pillar than the lower ones, and that each one is placed so as to be between two of the lower tier. This done, remove the remaining pots, and finish off the upper part of the pillar, with cement, to a fairly straight line on top. Colour to taste.

You have now a fernery with eight receptacles for ferns, which, being porous, will be well adapted for its purpose. The aquarium glass will require no setting, as the weight of the water will keep it in position; but if preferred to be a fixture, the tube must be filled with wet cement, and the bulb of the glass thrust in and left to set. Cost of fernery, complete, about 2s. 6d.

Fig. 14 is of the same dimensions, with the addition of a fountain, which adds very much to the attraction and interest of the fernery, and is easily managed; only instead of a propagating-glass, we shall want what is called a "bee glass," having a hole in the bulb not less than ½ inch clear; through this, and about half-way down the pillar, are passed the two lengths of ⅛ inch compo pipe; one being the supply-pipe and the other the waste-pipe. The waste-pipe should be carried up to within 1 inch of the top of the glass.

For the jet, solder on to the supply-pipe what is known in the trade as a "cigar-cock," the same being known in country places as a "pipe-light cock." When these two pipes are in position, run some cement into aquarium, to fill up the bulb, and afterwards build up with cement and cemented pieces of coke the pillar, as shown in Fig. 14. Where a continuous supply of water is not to hand, I have used the plan represented in Fig. 15—a small, half-round tank, made to hang on a stout nail or screw in the wall, to which is attached a flexible tube, connecting it with the fountain, using a large jug, or any other suitable and convenient vessel, to catch the waste, and return it to the tank as often as required.

Fig. 16 represents the manner in which a dead wall may be utilized as a fernery. It frequently happens that, in the small space of ground attached to small houses in crowded towns, which the landlord describes as "a pleasant garden," that one or more of the walls either hides or is in the shadow of some other wall that hides the sunlight, which is absolutely necessary for the cultivation of flowers. After many futile attempts, the tenant at last comes to the conclusion that "*nothing will grow on that side.*" Now, in nine cases out of ten, that is just the spot in which a most successful attempt at fern cultivation may be made. It will be somewhat of a dirty job, and will entail a little hard work; but the result will amply repay its expenditure, the materials required being 2 or 3 lbs. of 2-inch nails, a sack or so of gas coke, and some Roman cement and washed sand. Having broken up the coke into suitable sized pieces, bath them in a thin batter of cement. The next operation will be to knock a number of nails in the crevices of the brickwork, or material of the wall, at *irregular* intervals of space, and, having well wetted the wall, proceed to build up any number of various sized pockets on the wall, using the method described (Fig. 12), with the flower-pots covered in paper as moulds. Tie these to the nails in a slanting position, cementing them with Roman cement, with about one-fourth sharp, clean sand. Do not attempt to do too much at once, giving the cement time to set before removing the moulds. The more irregularly and roughly this work is done, the better it will look. When finished, plant your ferns and creepers, placing those nearest the bottom which prefer the most moisture. Extend the rockwork outwards at bottom as far as convenient, and when watering use a syringe; keep the rockwork always as damp as possible, as this will favour the development of mosses, lichens, etc. A similar plan will answer well on a window-sill balcony or other convenient place.

In thus describing the construction of rustic ferneries of cement, etc., and having briefly pointed to the application of this kind of work for out-door decoration, I venture to express the hope that those of my readers who take this matter up will not be content with the designs given, but will exercise their taste in developing what are only intended as the simplest forms of such work; in fact, they are sketches of the first articles I made myself.

In concluding this part of the subject, relating entirely to designs in rustic work, I may mention that a very nice effect is produced by finishing such specimens of rockwork as are intended for in-doors in black and gold, by giving the work two coats of boiled oil and ground black; then varnish with oak varnish, and afterwards touch up projecting points with gold bronze, mixed with varnish and gold size. This gives it the appearance of cast metal work, and harmonizes well with the tone of the ferns. Of course, where the idea is to represent natural rockery, this would be quite out of character.

In the next paper the designs given will be chiefly such as are intended for placing in the sitting or drawing-room, and their construction will necessitate some little practical knowledge of zinc-working on the part of the amateur, as also some little skill in finishing the painting—acquirements which may be very easily gained, as the material (zinc) is very easy to work, and the tools required few and simple; but for the benefit of those who can do carpentering, but do not care for "tinkering," some designs in woodwork ferneries will be given in a future paper; although I do not recommend the use of wood for the purpose in preference to zinc, the latter being lighter, easier of construction, and more durable when exposed to moisture.

(*To be continued.*)

RELIEVO MAPS AND THEIR CONSTRUCTION.

By JOHN BRION,
Constructor of Relievo Maps to H.R.H. the late Prince Consort.

II.—SUBSTANCES AND TOOLS FOR MODELLING—GEOLOGICAL CONTOURS—PROCESS OF MODELLING.

THERE are various substances in which the modelling can be executed : China clay, pipeclay, papier-mache, and, what I term, white composition. Only the last two mentioned require description.

To prepare papier-mache for modelling : Take white blotting-paper, and soak it in water till it is reduced to pulp ; squeeze dry in a cloth, mix thoroughly with the white paste already described, working it with a knife on a board or stone slab, till of the consistence of painters' putty, and you will have a pleasant and reliable substance to work with. For white composition modelling clay : Take best whiting, add one third, by measure, of common wheaten flour, mix with cold water thoroughly, and work it into a stiff doughy consistence. This is also very pleasant to work in, and stands well in moderately-sized geographical works. With any of these modelling clays proceed to work upon the bases of the hills shaded upon your mounted map.

A knowledge of geology is not indispensable to the constructor of relievo maps, but an acquaintance with the general contours of the geological formations will aid not a little in producing truthful modelling. To this end the sketch in Fig. 3, taken in connection with the third column in our table of heights will be found of value. In addition to this, I would recommend the obtaining, whenever practicable, of photographs, or reliable sketches, or engravings of remarkable localities ; the Cumbrian Group, and Snowdon, for example ; and if the modeller can sketch ever so little, we predict that from the time he commences the practice of the art his eye and hand will be often busy in jotting down the outlines of hills, etc., that meet his eye.

The tools necessary in geographical modelling are very simple : An ordinary paper-knife, and modelling *points* A, *stumps* or *flats* B, and *scrapers* C (Fig. 4), made of bone pen-holders, filed or glass-papered into shape, will enable the worker to produce almost any kind of form and delicacy of finish.

Let us begin our modelling at the Cheviots. Wash a little size or thin gum-arabic over the whole of the mounted map, and when dry build up, with your clay, the principal height marked by the rivet 1 (see Fig. 2 at p. 106), as 2686 feet, and then run a narrow piece of modelling clay along the remainder of the range, gradually throwing off the edges of the clay where the fainter shading indicates the lower elevations. Make the ridges of your hills irregular, and none so high as the point 1. Tool out the valleys in the hill sides till you have produced a contour of this appearance.

It is well not to attempt to finish the work too finely at first. In a day or two the clay will become set, and retain more faithfully the delicate touches thereon. A good general contour is what should be first sought for, details and high finish will then be easily obtained.

Leaving the Cheviots let us turn to the Cumbrian Group.

Although complex, this is by no means a difficult subject to model ; in fact, I have known it to be selected by several amateurs as an initiatory essay in clay or plaster work. This will be easily understood when we consider that the formation is little more than an association of blunted cones. I speak now of maps on small or moderate-sized scales ; on those of great magnitude the details and difficulties are, of course, increased.

Build the clay in cones upon the parts marked by the rivets, keeping each point quite distinct from the others, and leaving the valleys to be filled in after the modelling has become tolerably dry. When the whole is finished it ought to present the general outlines shown in Figs. 6 and 7.

From Cumberland we will pass to the York Moors. Here, on the cretaceous formation, we entirely change our style of modelling, making the elevations neither craggy nor conical, but an assemblage of bold undulations, sometimes steeply scarped. The York Moors may be briefly described as a table-land, beautifully diversified with broad uplands and wide fertile valleys, guarded by a grand natural wall on the west, and sloping gently down to the plain on the south, and to the lofty cliffs overlooking the ocean on the east. The sketch in Fig. 8 will, perhaps, aid the modeller in realizing our description, as well as serve as a guide in the work.

We may here mention that it is of often great advantage, when constructing a map on a small scale, to refer to one of much larger size, as features are there frequently represented which throw great light upon the smaller work.

We now come to the Pennine Range, Fig. 9. This has, not inaptly, been termed as the backbone of England. Extending from the Cheviots to Derbyshire, a distance of a hundred and sixty miles, and presenting an almost infinite series of bold contours, it offers an excellent subject to the modeller.

The Pennine Range may be generally described as a serpentine chain of lofty hills, running from north to south, with lateral spurs of very unequal length ;

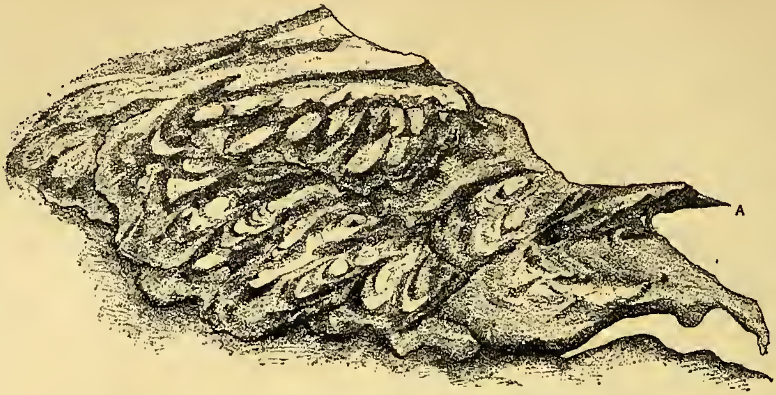


FIG. 8.—THE YORK MOORS. A, FLAMBOROUGH HEAD.

those on the western side being generally short, and ofttimes forming steep, craggy escarpments. Those on the east descend in long gradual stretches, enclosing broad valleys, which gradually blend, in graceful undulations, with the broad features of the lower lands. Being composed chiefly of mountain limestone, the scenery is very striking, both in boldness and variety: lofty crags, broad rocky platforms, and wide table-lands, are the chief characteristics of the region. The summits form a distinct water-parting between the eastern and western river systems of the northern counties of our land. The sketch in Fig. 9 will, we think, convey a fair general idea to the modeller.

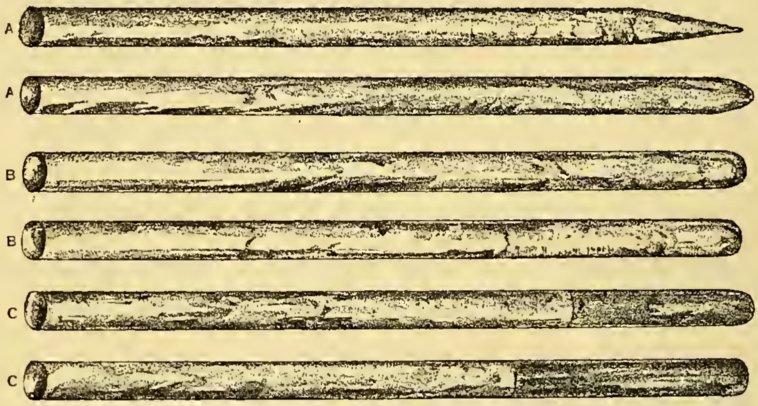


FIG. 3.—MODELLING TOOLS. A, POINTS ; B, STUMPS OR FLATS ; C, SCRAPERS.

It is necessary in this, and indeed in all cases, to adhere strictly to the areas marked by the hill shading of the map you are modelling upon, and to take especial care not to obliterate or confuse the river courses, or, when the process of embossing is effected, you will be presented with the phenomena of rivers running up or over hills, etc. A little attention and frequent reference to your unmounted map will save much after-trouble in corrections. I have not hitherto spoken of the necessity for strictly adhering to the heights marked by the nails as the summits of the hills. On no account lose sight of these by modelling over them. The little metal head of the nail represents the crown of the mountain, or other elevation, and this should always be seen, a little bright speck, amidst the surrounding clay. Attention to this particular will secure reliable vertical proportions.

The order in which I recommend the modeller to proceed is as follows :—

From the Pennine Range, to North and South Wales; thence to the Malvern and Cotswold Hills; East Anglian Heights, Chiltern Hills, Cornish Heights, Exmoor, Dartmoor, North and South Downs. My sketches, Figs. 10—13, illustrative of the general features of the chief points of these, with reference to our table of heights and geological formations, will enable the constructor to give a distinctive character to each locality. Admirable as are the works of Keller and Dobbs, in many respects, especially the Switzerland of the former and the Palestine and Arabia Petræa of the latter, this point has been almost entirely neglected, yet I believe all

FIG. 9.—IN THE PENNINE RANGE, NEAR KILLHOPE LAW.

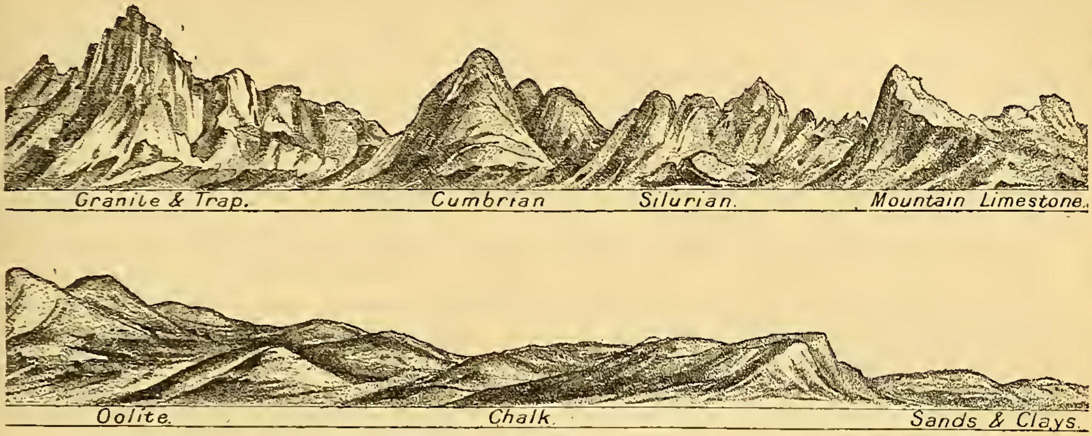


FIG. 3.—CHARACTERISTIC FEATURES OF THE PRINCIPAL GEOLOGICAL FORMATIONS IN ENGLAND.

FIG. 5.—THE CHEVIOTS, LOOKING NORTH.

FIG. 6.—BORROWDALE, CUMBERLAND.

FIG. 7.—SKIDDAW AND SADDLEBACK.

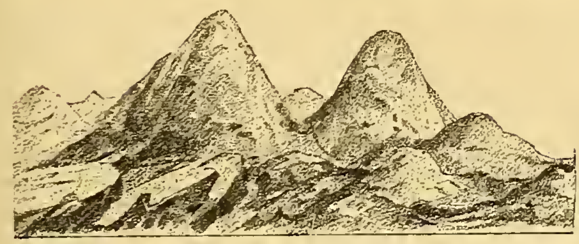


FIG. 10.—SNOWDON.

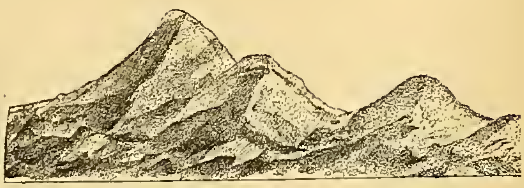


FIG. 11.—CADER IDRIS.

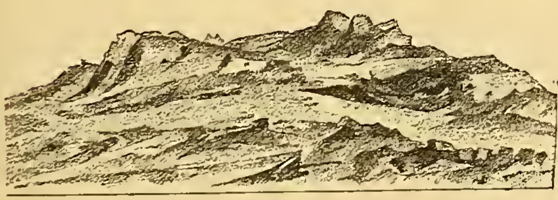


FIG. 12.—HEYTOR, DARTMOOR.

FIG. 13.—BROWN WILLY, CORNWALL.

will agree with me in thinking that it is one that cannot be too strongly insisted on. The great charm of a model or of a relievo map is its close resemblance to nature; hence, distinctive features, as well as general correctness, ought to enter as much into the work of the modeller as facial contours and expression do in the work of the portrait painter.

Suppose the principal heights, on the map, to be modelled, it will be desirable to leave the work for a day or two to get well set. No specific time can be named for this, as it depends on the state of the weather, the warmth of the work-room, the size of the work, and, consequently, the bulk of clay employed. A very little practice will enable anyone to determine when the modelling may be touched without disturbing the work already done. This decided on, we will commence the secondary modelling.

This consists in filling in the lesser elevations, as the Lincoln Heights and Wolds; the Malvern, Cotswold, Mendip Hills, etc.; the Central Tableland; isolated parts, as the Wrekin, Langdon Hill, St. Catherine's Hill, etc. This will lead to the third modelling, in which we add the minor spurs of the principal hills, level up the land and beds of the river gradually towards the salient heights, which have hitherto appeared as sharp, abrupt landmarks upon a dead level. This portion of the work is apparently easy, but it requires considerable taste and judgmen to distinguish between the leaving of the model abrup and unnatural (as will be the case if the valleys and uplands are not judiciously filled in and made to blend naturally with the bases of the hills and mountains), and the obscuring of the work by filling in the lowlands too heavily. In a word, the point to be aimed at is to avoid rendering the work blunt and indefinite, on the one hand, or "patchy and poor," by neglecting the natural lie of the slopes and depressions, on the other.

In working up the valleys it will be found most convenient to roll out a piece of clay of about half the width of the depression, and with a modelling tool to gently spread this till it reaches the hill sides, and is made to blend with the first portion of the work; the sides and bed of the valley will then naturally follow. At this stage it may not be amiss to repeat the advice given concerning the taking care not to obliterate or mistake the river beds. Although the map which you are modelling upon is now supposed to be nearly hidden beneath your clay, yet reference to your unmounted map, and occasional use of your compasses will enable you to keep the water-courses true.

The cliffs, and coast line generally, may be now laid on. This should be done by rolling out a long sinuous piece of clay, and running it about a quarter of an inch from the coast. A gentle pressure with the fingers upon the top will flatten it, and make it approach the line of coast. Work on this by vertical strokes of your modelling points, and you will obtain the distinctive features of cliffs, as will be shown in Fig. 14 in the next chapter. Smooth your clay gently down seaward, where there are no cliffs, and blend it into the undulations of the land beyond.

While working up to this point, the model should be frequently brought to the level of the eye, and the contours rigidly examined on all sides. By such a view, errors will ofttimes be detected that might escape the ordinary bird's-eye observation, and new ideas are also frequently suggested by the horizontal survey.

During the progress of the work it will be found necessary to moisten the modelling already done before adding new clay. This should be effected by passing a camel-hair pencil, dipped in cold water, gently over the dry surface. The modelling clay, when not in use, should be kept in a damp place or in a damp cloth.

(*To be continued.*)

AN AMATEUR'S PHOTOGRAPHIC STUDIO AND ITS CONSTRUCTION.

By JAMES PARKINSON.

II.—THE DARK ROOM AND SKYLIGHT.

AFTER the completion of the Studio, the next thought of the builder will be, "What am I to furnish it with?" Like young housekeepers, he must do this as his purse will allow. If it is not in a very flourishing condition, he must purchase just those things that are absolutely necessary, and, as circumstances permit, he must add to his stock.

But before entering into any description of furniture accessories, etc., we must consider the interior arrangement of Dark Room and Studio.

The Dark Room.—As the success of all our efforts depend, in a great measure, on the arrangement, cleanliness, and order of the dark room, it will be well to consider, with the greatest possible care, how we may make it as nearly perfect as possible. "Show me a man's dark room, and I will tell you if he be up to any good," used to be the saying of a well-known photographer.

The first care must be to guard against every particle of dust, and to effect this the walls and ceilings must be coated with a good coating of oil-paint of a non-reflecting colour, as dust cannot adhere to a painted surface with the same tenacity as on plain wood.

Some photographers run into the error of making their dark rooms dark in reality. In fact, I have been in some that may be compared to dungeons. This is a great mistake, as plenty of light is essentially necessary. You may use nearly any amount of light, providing it be perfectly non-actinic. Two sheets of glass should be perfectly safe, one of dark ruby, the other orange. It is very safe to use only one orange pane, covering it with a sheet of ruby paper.

When not in use, the windows should be thrown open to admit of plenty of ventilation, as this is necessary to preserve health.

A well-known writer in the photographic journals comments on the dark room as follows :—" The photographer's dark room (or 'laboratory', as some name it now, although I confess I cannot see the utility of putting one's tongue out of joint by rolling it round a high-sounding name when a simpler one will answer the purpose)—the dark room, I therefore say, is a sacred sanctum, wherein the manipulator performs a series of extremely delicate operations—a place where cleanliness, carefulness, and order must reign supreme, if he wants to make his work perfect—a place wholly and solely to himself; anyone will acknowledge this fact if he knows what good photography is. When a contaminated finger, a silvery beam of light, as fine as a gossamer thread, or a few particles of dust, can spoil, or, at least, mar, the beauty of his work, it is but right that the worker should be left free from meddlers or careless *employés* in the same establishment.

" In a great many studios, the dark room is a place synonymous with a lumber-room; the word dark, I suppose, having originally suggested to the mind something dirty, dusty, dingy, down-among-the-coals sort of a feeling ! Hence, it becomes the repository of broken cameras, dilapidated slides, dust-pans, brooms," etc.

What the writer wishes to impress will be easily understood to be carefulness, cleanliness, and the most perfect order.

To test the room for leakage of light, shut the door, then cover the window up, and set to work and fill every crevice where the light enters with any suitable material. Under the window, at a convenient height, should be fixed a strong bench, which should be perfectly level and steady. In the centre, where the light falls, must be fixed a sink—I prefer one about twelve inches deep—which should be let in flush with the bench; and, if thought necessary, the bench may be fluted, so that the splash water will find its way into the sink, and thus do away with a dirty, sloppy operating-table.

For my part, I prefer to sit down to my work, both in the dark room and tent. If this is thought desirable, the bench and window must be erected at a suitable height. There should be a plentiful supply of water; a tube should be fixed to the tap, with a rose attached at the end, and then there is no fear of damaging the film, and a large plate may be flooded very quickly. Of course, a pipe must be carried from the bottom of the sink to the drain to take off all waste water. A towel and sponge will be found most useful in the dark room, and a plentiful supply of damp cloth for cleaning down. The dark room should be kept most scrupulously clean, and for this purpose a mop should be used. Never use a brush.

Do not fall into the fond error that the dark room should contain a regiment of shelves. If possible, do not have more than one, as they are sure to harbour dust, and tempt one to lay up old negatives, or a quantity of old bottles, with a beautiful collection of dust thickly coated on each, which, at the first draught, would send up a cloud, which, if floated upon a landscape negative, would not produce a very harmonious cloud effect.

If it is possible, have a separate room for stock chemicals, printing materials, and all other apparatus and appliances not used in direct connection with the operating and developing processes. A good workman will have a place for everything, and keep everything in its place.

The Skylight.—I shall now draw attention to the skylight, with the arrangement of blinds, etc. Here the first care must be to provide means to shut off the light at will, or cast a shadow, if desired, in the required direction. What is desired in portrait photography is diffused light; so, therefore, the amateur must proceed to make blinds, etc. Almost every operator has some plan peculiar to his own ideas, and to describe the various methods in use would be the work of almost a lifetime. The method I am about to describe is, I think, as practicable as any, and better than a great many in use. It consists of light frames of deal made to fit each sash; so therefore four will be required for the top and four for the side-lights. The frames should fit perfectly, so as to avoid leakage of light. They should be covered with a bluish-coloured material, which will filter the light, and render it very soft and diffused, and therefore capable of producing any desired effect, and under perfect control. The frames are hinged with two or, if thought desirable, three hinges, so that the light may be directed towards that part of the studio where the sitter is posed. The top screens are held in position by means of cords which are secured to catches; or, if desired, the top screens may be dispensed with, and a series of bluish-coloured blinds substituted in their stead, which run from the ridge to the top of the side-light on iron rods, in accordance with the mode of arrangement usually adopted by most professionals.

Another method may be described as follows:— Instead of the wooden frames, the light is filtered through bluish-coloured curtains, which are secured to the ridge, and capable of being moved up or down at will, after the style of an ordinary window-blind. If these were made on the principle of the blinds of railway-carriages, which are held in position by self-acting catches, it would do away with the clumsy and troublesome method of tying them in their places each time the direction of light is altered. It must be clearly understood that the blinds of the top-light draw down, and those of the side-light pull up.

The following is a new method of lighting the sitter, which is effected by means of a portable head screen and reflector, adapted from the American studios, and fully described in a "special work" issued by M. Klary, of Algiers, of which the following extract will give all the necessary information:—

"I lay down as a primary principle, that the art of managing the light is of paramount importance; for a picture is imperfect when it is deficient in those middle tints in the high lights, which make it an artistic work. The study of lighting is more intricate than that of posing, but in the posture, and the lighting of his model, a photographer proves himself an 'artist' instead of a machine."

Light and shade giving us all our effects, our ability consists in using both in such proportions that we obtain at will the most varied effects.

The top and side-lights together are generally adopted in the construction of photographic studios, but it is in the injudicious use of the latter, especially when employed in too great a quantity, that many fine effects are lost, and the resulting picture is rendered feeble, the natural shades of the face destroyed, the features distorted, the eyes, the mouth, the upper lip especially, shorn of their full expression, and the whole face wanting in graceful and natural relief.

For heads and half-length portraits, it is quite unnecessary to use the side-light in so large a quantity as is usual; the top-light when under judicious control, will give the better and more artistic effects of light and shade. It is necessary that the light be balanced in accurate proportion, the time of exposure sufficient to set forth the lighting, and the development adjusted according to the exposure.

These general remarks will apply to the old wet collodion process, but much more forcibly to the New Bromo-Gelatine process, in which exposures are calculated by fractions of a second, bearing in mind that the modern form of dry plate possesses the power of bringing out details to the minutest degree, and depicting every beauty of light and shade in the subject, which a collodion plate would fail to render, it is important that the lighting of the face should be balanced in such a way that the contrasts may not be simply black and white, but a soft gradation of all the intermediate tones, as well in the lights as in the shadows, so as to produce a graceful and artistic picture. "*There are no pure whites to be depicted in the human face,*" though there are some portions which may be nearly so; the whole face should be more or less shaded and some luminous touches be slightly thrown on the most prominent parts: the greatest distance from the eye of the beholder should be darkest in tone—the nearest portion the lightest—and every gradation between.

Of the three lights used in the studio, the *diffused* may be employed in the greater quantity; the *reflected* must be more restrained; and the *direct* used more sparingly and judiciously.

The position of the sitter should be *under* the principal or strongest light. It is best to employ a soft and slightly-diffused light, combining in due proportions the top and side. This is readily obtained by the use of the head-screen, which being constructed with various movements, will enable the operator to have the light under perfect control. It should be placed by the sitter, nearest to the light, and of course outside the focus of the desired picture. It must be elevated above the head, raised, or lowered, and turned to the required angle, until the operator observes the true and best effect upon the shade and lines of the face.

There will now be seen a generally diffused light over the whole of the figure, but a little predominant on the side nearest the source of light; then open a small accidental side-light in front of the sitter, which will fall upon the prominent parts of the face. If the eyes are sunk deeply, lower the screen a little, and move it slightly towards the shaded side of the face: it will thus increase the top-light, and bring the face into bolder relief; the shaded side, though slightly darker than the other, will remain soft and full of detail.

Observe that the reflex of the eye must be the same in each. These luminous points have their places on the upper part of the eye, and nearest the side-light, not in the middle. If the reflex appears in one eye only, the face is too far from the side-light. Then move your camera, and turn the face towards the side-light, till these luminous points appear in both eyes; the head will then be well lighted, and the outline of the nose well rendered. A beautiful and often unforeseen lighting will be discovered by the movements of this screen. Being made of translucent material, it softens, filters, and slightly diffuses the light over the head of the sitter, and is an immense power in the hands of a skilful operator for obtaining in any studio those fine effects of light and shade

which produce a perfect picture, and which could not be easily obtained by any existing arrangements of blinds and curtains; in fact, the control of the light over the sitter is much more complete and easy to be obtained by the use of this screen than by any other means; and it will be found that less retouching is necessary upon the negative. With taste, and a little practice, its use will become intuitive.

It is often necessary to soften the edges of the shadows, in case of need, with a pure and delicate reflected light. This is done readily by means of a concave reflector, used in accordance with the judgment of the operator. It should be turned towards the sitter in such a manner as to throw a concentrated light upon that part of the face under and behind the eye, as well as the darker portions of the neck, and thus the spot of reflected light appearing in the eyes will be avoided. A perfectly exact position of the reflector is as essential as for the head-screen, in order that the proper balance of lighting may be obtained.

For lighting *à la Rembrandt* do not change the position of the face, but move your camera so as to obtain a view of the other cheek, and cause some slight modification of the head-screen; this lighting will be as perfectly rendered as the other. It is not here necessary to use the reflector, the head-screen alone will regulate the top-light, which must be used sparingly, so that it does not fall upon the points where the middle tones are wanted. The prices of the head-screen and reflector used in the new system of lighting are given at the end of this paper.

Now that we have the light fully under our control and management, our next thought will be how we can best and most economically make our little studio look bright and inviting. The floor should be covered with any suitable material as pecuniary circumstances will admit. Carpet is the most homely and suitable covering, but if this should be thought too expensive, the next best and cheapest material is oil cloth, but that part of the studio where the sitter is posed must be covered with a suitable square of carpet. In choosing your carpet avoid those colours that are of a non-photographic colour.

Pictures may be hung upon the walls of the studio (where the skylight does not touch), and these, if they be of corresponding harmony with our fine art, produce the most pleasing effect. In the selection of these avoid productions of a cold, reserved character. As the hanging space is small, the pictures must be selected with the greatest possible care, watercolours producing the most pleasing effect, if of small size and surrounded by a wide margin of mount. To these may be added, with good effect, a few framed photographs taken by the owner of the studio. Brackets may pleasantly adorn the gallery—the designs contained in the supplements of back numbers of AMATEUR WORK, will furnish ample variety of these—on which should be supported busts of the great masters, but these adornments must not be too numerous, or the effect will be entirely lost.

The next thought will be on the choice of backgrounds for general portraiture and vignettes. The most perfect and economical material for backgrounds is the "Empire" Patent Opaque Cloth, as both sides are equally available, the dark for general and the light for vignettes; this may be had by the yard in various widths, or mounted on roller complete. It is a textile fabric, prepared in such a manner as to render almost invisible the meshes of which the fabric is composed. This material is non-reflecting.

[The "Empire" Patent Opaque Cloth for backgrounds mentioned here is supplied by Messrs. J. Avery and Co., 81, *Great Portland Street, London, W.*, who will send priced samples post free to any applicant. The accessories for the studio, to which reference is made below, are supplied by Messrs. D. H. Cussons and Co., 79, *Bold Street, Liverpool*, and are fully described in the "Photographers' Pocket Almanac and Reminder," issued by this firm at 2d., and noticed in Part XV. of this Magazine.—ED.]

If something more artistic be desired, an interior or exterior background must be purchased, but these only mar instead of aiding artistic productions, unless they are the work of an artist, and used with considerable thought and skill; moreover, if you have fancy backgrounds, you must have furniture and accessories to match, and selected according to the nature of the background.

For exteriors, a rustic style, imitation tree-trunks, rocks, etc., may be introduced with pleasing effect. The imitation tree-trunks are very beautiful, being modelled from nature in a very light material called "carton pierre," and so are very handy for moving about the studio.

If you have an exterior background, you will require a covering for the floor, as trees and rivulets would not harmonize very well with carpet (as too often seen in 5s. per dozen cases). There are imitation grass mats, size from 6 feet by 4 feet, which are very effective, and photograph better than real grass.

If the background represents an interior, the furniture and accessories must be suggestive of the background. Small fancy tables, art curtains, rugs, velvet cushions, may be introduced with good effect. One of the great mistakes made is overcrowding.

The most pleasing *pose* for children is seated on a rich cushion, with drapery introduced. If desired, young children are best photographed in the seminude. If the exposure is made exactly at the right

time, some of the most pleasing and artistic portraits may be secured (of course, I mean instantaneous) that could possibly be desired, avoiding any expression of a hard or unchildlike, sober character, the two extremes producing the most charming effects, viz., laughing and bellowing.

One of the best guides for an amateur is to purchase some of the very beautiful photographs advertised for sale in most of the stationers' shop-windows in every town. Then, on the choice of the posing chair, if the conditions of the purse will allow, purchase one of the very best. The "Æsthetic Poser" is the best and most perfect in the market. It forms four chairs and two couches, each distinctly complete in itself. It is made in unpolished walnut, upholstered in peacock-green velvet, and is a handsome piece of furniture.

The following may be taken as affording a closely accurate price list of accessories, appliances, and various articles mentioned in the foregoing paper :—

	£	s.	d.
Backgrounds, Etc.			
Empire Patent Cloth, 8 ft. by 6 in.	1	5	0
Fancy Painted Interior, 8 ft. by 7 ft.	2	2	6
„ „ Landscape, 8 ft. by 7 ft.	2	2	6
Art Curtain, 10 ft. long	0	15	6
Real Skin Rug (photographic colour), 6 ft. by 3 ft.	0	15	0
Imitation Grass Mat, 6 ft. by 4 ft.	0	12	6
Fancy Velvet Cushion and Velvet Drapery.	1	1	0
Basket of Artificial Flowers (arranged for photo.)	0	5	0
Imitation Tree-trunk (carton pierre)	1	15	0
Furniture.			
The Triune Chair, 3 changes	3	10	0
The Argyll Chair, 5 changes	5	15	0
The Sultana Chair, 3 changes	6	10	0
The Æsthetic Poser, 6 changes	10	10	0
Small Fancy Table	2	10	0
Garden Terrace	5	10	0
Appliances.			
Head and Body Rest	1	6	0
The Emmerson Patent Head and Body Rest	2	10	0
Camera Stand	2	10	0
Appliances used in the New System of Lighting the Sitter.			
Portable Head-screen	1	10	0
Concave Side-reflector	1	0	0

With a judicious selection from these appliances the amateur photographer will find himself provided with every thing that he can require for studio fittings. A handy man may contrive substitutes for some of them for his own use.

BRASS CASTING AT HOME.

By F. J. DURRANCE.

II.—THE CRUCIBLE—MELTING METAL AND MAKING CASTINGS.

ON reading over my last article, I found omissions — which I now correct. In casting several layers of plaster, it is advisable to put two or three drops of ink (of various colours) into each of the castings, the line of division will be then plainly visible; secondly, if any wax sticks to the mould it can be easily removed by pouring on boiling water, it will do no harm to the mould. Those who are desirous of learning more than is stated here with regard to the mode and desirability of tinting different layers of plaster in making moulds for casting, are referred to "Casting in Plaster of Paris," Vol. I., page 371. The information required will be found in the section with the side-heading "*Waste Moulding in Plaster.*"

Now, to proceed with the casting. The first and most essential thing required, is a crucible—one hold-

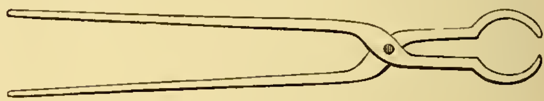


FIG. 7.—CRUCIBLE TONGS.

ing about two pounds will be the most convenient size, as it is desirable to always have a surplus, and the larger the quantity the longer it will keep hot. The crucible can be obtained from most dealers in chemical materials, or, better still, from Mr. T. Fletcher, *Museum Street*, *Warrington*, and I should advise all the readers of "ours" to send for his catalogue. No one will regret doing this.

The next thing required is some method of melting the metal. To those of our readers possessing one of Fletcher's furnaces, all further trouble is at an end; but as most amateurs do not possess that valuable piece of apparatus, we must use the ordinary fireplace (if you have not a furnace at your command). Previous to melting, store up all the half-burnt cinders which drop out of the fire (if you have no chance of obtaining gas coke, which is superior); next prepare the fire by cleaning out all the dirt and small ashes, leaving a small quantity of clear fire; next, put on a few cinders, on which to rest the crucible, which must be filled with old scrap brass, turnings, borings, etc.: if you have not sufficient, any plumber will let you have some cheap. The crucible must be placed firmly, and perfectly upright, on the cinders, and well towards the back of the fireplace, then packed all round with more cinders; having put a large lump on

the top to form a lid, cover quite over with more fuel, then put up an old tea-tray, and by all the means at your command stop the air from going anywhere but through the bottom of the grate, also open any doors near the fireplace, to allow a free current of air to pass; if you have a pair of bellows, or any other arrangement for blowing, by all means use it. I have never yet met with any ordinary fire-grate on which it was not possible to melt brass, so with ordinary care you are bound to succeed.

The mould having previously been well-dried, must be made as hot as possible, by placing in the oven, or very near the fire, for the hotter the mould the easier the brass will run; if your metal is very dirty, put in with it a little salt, or borax, as a flux; the dirt will then rise to the top, and can be skimmed off with a piece of iron rod. The fire being now burned through, lift off the large piece of coke, to skim off dirt and see if it is melted; if it looks very white and quite fluid, get ready to pour. Put the mould as close to the fire as convenient, then with a pair of crucible tongs (Fig. 7), or failing these, make a pair by fastening two pieces of thick iron wire to the ordinary fire-tongs, by binding with copper wire, then grasping the crucible firmly, pour smartly, until you see the metal rise, and fill both holes, in a few minutes it will be sufficiently set to open. I hope the result will be success, if not, try again, you *must* succeed. To those wishing to make their own alloy, I give some receipts:—

1. *Bell metal*—Copper 3 parts, tin 1 part.
2. *Brass for light castings*—Copper 4 parts, tin 1 part.
3. *Brass for hard castings* (for heavy work)—Copper 8 parts, tin 2 parts, zinc 1 part.

The hardest metal to be melted first, then add the rest, stirring up well.

For all ordinary purposes these formulæ will be sufficiently near as regards the proportions of the metals used, but it may be useful to append others in which the relative quantities are adjusted with greater nicety.

1. *Brass for light castings*—Copper 16 parts, tin 2 parts, zinc 1 part.
2. *Brass for heavy castings*—Copper 100 parts, tin 17 parts, zinc 8 parts.

Caution.—Ordinary clay crucibles must be very carefully warmed up, and cooled, or they will crack. If you use the salamander brand no care is required, and they cost a mere trifle more; secondly, remove the hearthrug, in case you spill any metal and set fire to the house.

The next article will deal with circular, or lathe-work, cores, etc. I shall be glad to answer any questions through the ordinary channel.

(*To be continued.*)

AN EASY METHOD OF DECORATING BOARDED FLOORS.

By CRABCROSSE.

THE long parallel lines of an ordinary boarded floor are far from pleasing to the eye, and hence, unless it be carpeted throughout, the room never presents a satisfactory appearance to the housewife. The "upset," however, of taking up and cleansing these planned carpets, is so great, that they are often allowed to remain down until they become an abiding place for dust, and sometimes, a home for things of a far more objectionable nature; while if there could be some means found of breaking the bare monotony of the boarded floor, the occupant of the room would soon perceive that a rug by the fire-side, or a square of carpet where the table stands, is all that comfort requires.

The object of the writer is, therefore, to furnish the amateur with an easy method, by which any floor laid with ordinary deal boards may be so decorated, that he may please himself as to what extent of carpeting he may care to lay down upon it. The system may be carried out for boarded floors in all parts of the house, and may be applied to the side decoration of halls, passages, and stairs.

This system of decoration consists in crossing the "joint-lines" of the boarded floor with transverse lines, incised so as to divide the surface of this into squares, and then by boring holes, according to a design fixed upon, and driving into them pegs of black, or dark-coloured wood, to give an ornamental character to the whole. By a glance at Fig. 1 the reader may form an idea of the style of decoration which may be produced by this method.

The steps by which this kind of floor decoration is done, have now to be given *seriatim.* The width of the boards is of no consequence, but floors are so generally laid with 7-inch wide planks, that it may be taken for granted that the floor to be decorated will be one of this kind. If the planks be wider the only difference will be an enlargement of the squares into which the floor is divided.

In setting out the work according to the design given in Fig. 1, which represents one-fourth of a square floor, the first step will be to find the joint-line, or the plank which lies in the middle of the floor, or comes nearest to it. Let us suppose a joint-line A A in this instance to be in or nearest to the middle of the room; then the line B B bisecting it at right angles should be drawn, and this will divide the floor, as nearly as can be, into four equal parts. On either side

of the line B B draw other lines parallel to it, and each one at the distance of 7 inches (or width of plank) from its neighbour line, until the whole floor is marked out in squares.

This being done, the actual work of a simple pattern like the part marked A C E D, might be begun at once; but for the more elaborate border part it will be necessary to mark in the additional lines in the sub-borders F, F and G, G, as well as the centres for the black pegs in the intermediate portions. When all cross lines will be by means of a plough, a straight-edge being fixed on the floor as a guide. The plough used for making the grooves for some kinds of glazing would probably be the best. My carpenter called it a "filister," a name derived, perhaps, from its cutting a thread (*filum*) line. In cutting these transverse lines, the operator will not, however, attempt to start from, or continue the line to, the outside of the pattern, but will leave one square at least at either end, to be cut in by hand with a chisel. Indeed, all

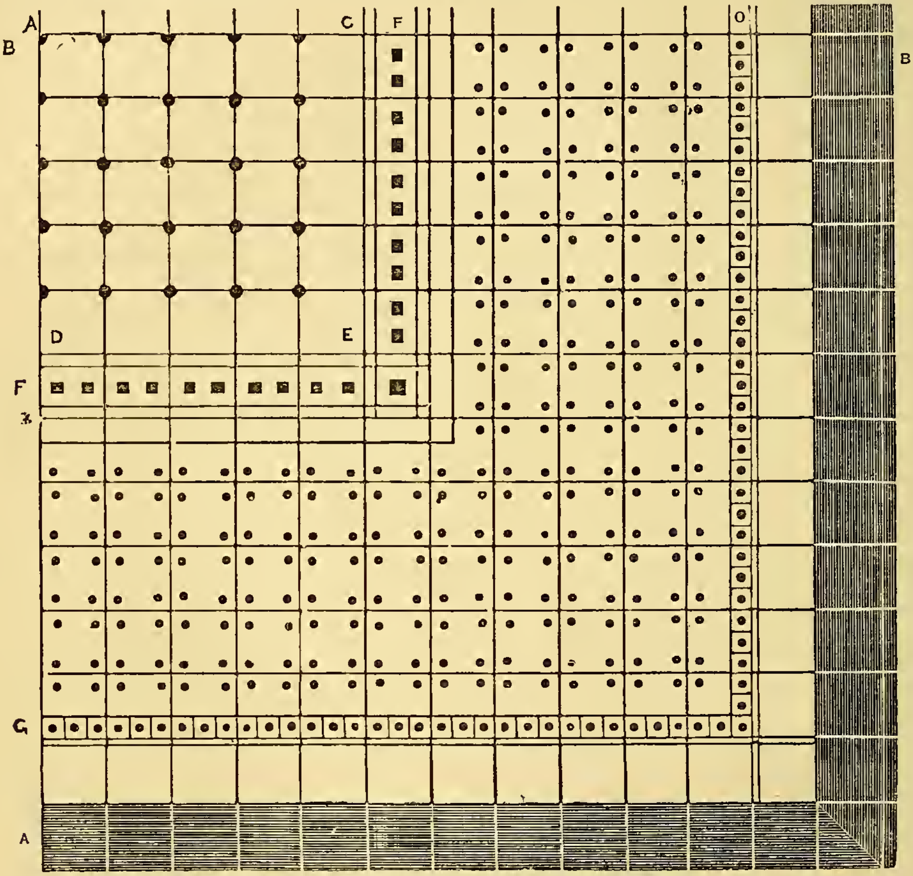


FIG. 1.—SIMPLE DECORATION FOR BOARDED FLOORS. EXAMPLE OF METHOD OF SETTING OUT WORK.

this is done, the floor may be considered as set out ready for the actual work.

The first operation will be to cut in the transverse lines, viz., all those lines running parallel to B B, together with this line also, and the width of these lines must depend upon that of the joint-lines. Where the boards have not been well seasoned the joints will open $\frac{1}{8}$ of an inch or more, but we may consider $\frac{1}{16}$ to be the average width of opening in the joints of a fairly seasoned floor of these days.

Where the floor is level, and the boards are uniform in grain, the quickest way of incising the lines will be best cut in with this tool if the boards be "shakey" and inclined to splinter, or if the floor be uneven. A good sharp V chisel, or dividing tool, if the operator has one, will be found of service. Where the joints are very close, it will be sufficient to cut in the cross lines deeply with a knife, and follow this up with a hard black crayon—indeed, a crayon should be drawn along all the incised lines, so as to give them the dark appearance of the old joint-lines, or a stain may be used for this purpose.

The transverse and other right lines being cut in, to make the holes for the pegs will be the next opera-

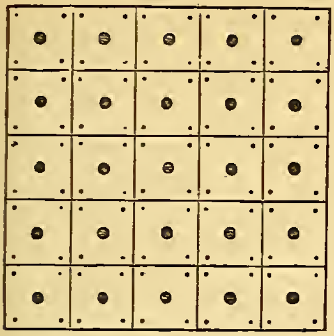


FIG. 2.—DECORATION WITH PEGS ONLY.

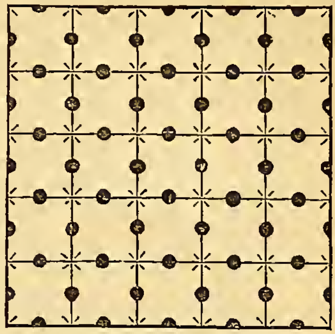


FIG. 3.—PEGS AND CHISEL WORK COMBINED.

tion, and for this work centre-bits of various sizes should be used, except where the holes have to be bored on a joint-line, as in the part of the design marked A C E D. Here an auger would be better, as the joint-line would furnish no steady centre for the point of the bit. Whatever tool is used, sharpness is indispensable, as the holes must be bored smooth and round.

The pegs must of course be of such diameter as to require driving into the holes with a mallet; and it will be found best to drive them nearly home, and then level off the top of them with a sharp elbow-chisel. Extra security will be given by gluing before driving them. As for the material, ebony pegs, or pegs of pine stained black, will afford the best contrast; but mahogany, walnut, or any dark-coloured wood, may be used with good effect. Stained pegs will require retouching with stain after being levelled off. In the patterns given, most of the pegs are round, but square pegs may be used, as in the sub-border, F F. Fig. 1, provided the holes be squared with a chisel to match them; indeed, though it involves more trouble, a very much better effect may be got by using pegs of this shape, set either square or anglewise, in conjunction with round pegs.

The pegs being driven in and levelled off, the short incised lines of the sub-border G G should be cut in, and darkened with the crayon, or a stain. If stain is used, "running" may be prevented, by taking off superfluous moisture with a piece of blotting-paper.

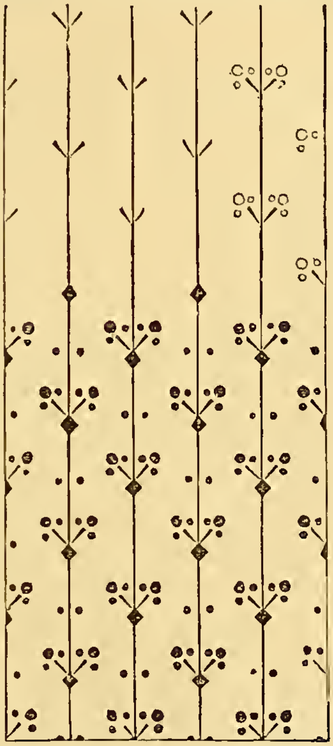


FIG. 6.—DESIGN FOR PEGS AND CHISEL WORK BASED ON JOINT-LINE ONLY.

It now only remains to be considered what shall be done with the margin, for as in no floor can one depend upon finding either a joint-line or a plank exactly in the middle, there will almost always be an inequality in the width of the margin; if this, however, be left tolerably wide, and it be stained of a dark colour by the process described in page 106, Vol. I., of AMATEUR WORK, the difference of width will not catch the eye. In Fig. 1 the shaded part represents this stained margin.

In case a plank instead of a joint-line occupies lengthwise the middle of the floor, the setting out of the work must be begun by drawing *two* transverse lines, 7 inches (or width of plank) apart across the middle of the floor, so as to give a centre *square* instead of a centre intersection.

The other illustrations—Figs. 2, 3, 4, 5—show various patterns, which may be carried out in this work. In three of them a little additional chisel-work is introduced, by which considerable relief may be given. Without doubt, by the aid of the chisel and knife-file, a pattern, dispensing with long transverse lines altogether, might be carried out with pegs—a design based upon the joint-line only, as in Fig. 6. This, however, I have never seen tried, but those for which directions have been given above have been carried out with remarkably good effect.

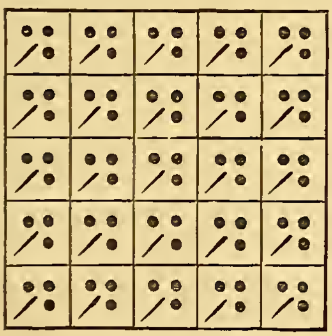


FIG. 4.—DECORATION WITH PEGS AND CHISEL WORK COMBINED.

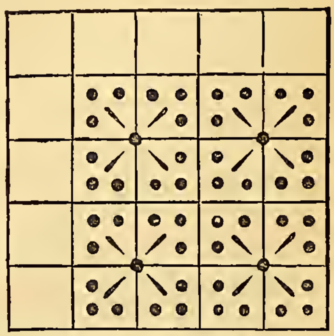


FIG. 5.—DECORATION WITH PEGS AND CHISEL WORK COMBINED.

JOINTING WOOD IN ALL ITS BRANCHES.

By JOSEPH COWAN.

IV.—VENEERS—JOINTING, LAYING, AND GENERAL TREATMENT.

ALTHOUGH veneers and veneering is known to be thirty-three centuries old comparatively little is known or understood outside the craft in which they are used, very beautiful results are obtained by very simple means—so simple, indeed, that it is surprising how little is done by the amateur in these days of activity and progress.

In the first place, it is not generally known that "veneers" and "inlay" can be obtained almost as easily as boards, for both are sold in the same place, and by the foot. Before the operator can do much in the way of veneering, he must provide himself with means to produce *pressure*, hand-screws (which are sold at tool-shops) first, then screw-presses, of any make or size, until he arrives at the patent "gas caul screws," which is the acme of veneering. When once the veneer is cut to the size of your work (but here let me show you the best way of cutting it, as it is so liable to split), place the veneer on a flat board, taking care there are no bits of wood nor anything underneath; mark to your size, then cut the lengthway of the wood with a steel point or marker, against a straight-edge; the cross-cuts do with a fine dovetail saw. If this is attended to, there will be no fractures to mend. Very plain wood may be cut with a chisel or shoemaker's knife. Burr walnut veneers can be cut with scissors to advantage.

Straightening.—Most woods are straight enough for laying, but some are buckled, and some cockled, especially French burr walnut (this is largely used in pianos). The treatment for "burr" is: size on both sides with very thin hot size; when quite dry, press between hot plates of metal (zinc is the best) or hot pieces of wood, called cauls. This should be done in the whole veneer, and cut after.

Jointing.—If the wood is flowery, and you find you can get an effect such as is seen in centre-table tops or piano fronts; if for a panel with one joint, place two veneers as they came off in the cutting, or book-leaf fashion, put a nick in each end, so as it may be seen if they shift out of their natural position, and so spoil the matching of the figure at the joint. Now make your joint by cutting straight, and shooting with a fine-set trying-plane. Now try if they are a true joint, edge and edge, on a flat board; and if so, temporarily fasten them on said board with small cut tacks, taking care that the joint is up close. If one buckles up past the other, a fine tack po ted in will not harm it. Now glue a strip of paper, about 1 inch wide, fair on to the joint, let the glue be thin, and rub the finger along the paper, so as to smooth and even both glue and paper, and smooth it nicely down on the joint, so as not to leave a wale or ridge of any kind; use a bit of candle to prevent the fingers sticking, and so disturb the paper. When dry, it is ready for laying. All veneers must be thoroughly dry before laying, else they will pull hollow, and have a very damaging effect.

Butt-jointing Curls.—This is rather a ticklish job, and ill understood, even by workmen; but the result, when well done, has a taking effect. All curls (or feathers, as some call them) are cut into veneers, as the wood cannot be used in any other way; they are of two kinds, Spanish and Cuban. The Spanish is generally very superior; the Cuban is strong, figured in the centre, and plain and pale on the edges.

There are three or four ways of butt-jointing curls; but the only sure and certain way is by crossing the joint with a piece of inch deal. First flatten about 7 inches of the veneer from the butt with hot wood cauls or zinc plates; when gripped, dry the rest of the veneer carefully, it is so liable to crack and buckle with the fire; when set and cool, joint both on shooting-board, keeping them in their natural position if you wish them well matched, but before shooting damp one inch of the wood from the end on both sides, and give them ten minutes to swell, else your joint, when made, will be close in the middle and off at the ends. When shot to a joint, try, as directed in straight jointing, then tack down on flat board, take a piece of soft wood 2 inches wide, warm (not hot), and glue on to the joint with pressure, in half an hour you can loose it and turn it over to see if your joint is perfection, if so you may proceed with the laying. This time you must warm your ground, and in the middle only, and glue sharp a belt 2 inches wide corresponding to the piece of deal glued on the veneer, fix quick with two hand-screws previously set to the size, so that there be no bungling at the critical moment. Now you may more leisurely proceed to lay the tail ends. Have two cauls in readiness, the size (all cauls ought to be larger than the veneer, as the heat leaves the edges first, and if the glue gets set at the edges, it will not move freely from the centre; the result is lumpy, bad work), and hot as fire can make them—as before, have your handscrews set to the size; get help, and the quicker you get them on (one at a time) the better the work. Begin at the centre, and work out to the ends; before cauling raise the veneer and glue the ground well, see that the glue-brush reaches the central gluing. Now all being screwed up, see there is no slackness in any one of the handscrews, for much depends on the uniformity of the pressure. Leave to cool for two hours.

When the screws are taken off, leave the work face down on a wood floor for two days. At the expiration of that time you may remove the piece of deal from off the joint by planing, and not by heat or water; when the planing gets near to the veneer, use the toothed plane. As curls frequently pull hollow on the face, it is desirable to damp the ground on both sides, and before quite dry size the face side, and this ought to be done so that the damping and the sizing are not quite dry at the time of laying. To insure good work veneering should be two or three weeks in a dry, warm place previous to cleaning off. The neglect of this mars all previous painstaking.

Should the writer have inadvertently left out anything of importance, he will readily answer any answerable questions, or otherwise advise and assist any amateur who may be desirous of conquering the so-called secrets or handicraft of wood jointing.

ORGAN BUILDING FOR AMATEURS.

By MARK WICKS. frm 168

IV.—THE BELLOWS.

WE now take up the construction of the bellows, upon the action of which depends in a great measure whether the organ shall or shall not be a pleasure to play upon. If the bellows are too small, or the valves imperfect in action, or the leather joints too tight, so as to cause squeaking, they would be a never-ending source of annoyance both to the performer and the audience. By carefully following the instructions which will be given herein, the amateur will, I hope, be enabled to construct a perfectly reliable article.

A glance at Fig. 50 will give an idea of the general appearance of a reservoir with two feeders, as seen from the back. The upper portion consists of two distinct folds or sets of ribs, the upper set folding outwards and the lower set folding inwards. These ribs are fastened to framings, or boards—the top one marked A, being called the top board; B, the floating frame; C, the middle board, and D, the trunk-band. The feeder boards are marked E. In Fig. 51 you have a section of the bellows across the feeder, and this view being on a larger scale, shows every detail of the construction, both inside and out. You will notice that there is a set of valves on the top of the feeder board, and another set on the top of the middle board, both sets opening upwards. In its normal position, the feeder would hang down, so that it would be open to its fullest extent, and filled with air. On pressing the blower down, the feeder would be closed, and the air within it driven into the reservoir, and, on allowing the feeder again to descend, the valves in the reservoir would close and prevent the return of the air, whilst, at the same time, the valves of the feeder would open and admit the air into it, to be driven into the reservoir at the next up-stroke of the feeder. In the top board of the reservoir a safety-valve is placed, which, on the folds rising to a certain height, is opened by a string, and thus prevents any danger of the bellows bursting from too much air being forced into them, as the surplus air would escape at this valve. Weights are placed on this top board, and these give the necessary pressure to drive the air out of the reservoir, through the wind-trunks into the wind-chest of the sound-board. The folds of the bellows working opposite ways cause this pressure to be equal, no matter whether the bellows are wide open or nearly closed. If the folds were both inside or both outside folds, the pressure would be constantly varying. With this brief introduction, I now go on with my instructions for making the bellows.

First, then, prepare some 1 inch or $1\frac{1}{4}$ inch pine for the framings, and cut it up into pieces about 5 inches wide. The top frame is 4 feet 6 inches long, and 2 feet wide, and the next, or floating, frame is exactly the same size. The middle board frame is 4 feet 9 inches long, and 2 feet 3 inches wide, and should be made of $1\frac{1}{4}$ inch stuff, as it bears all the weight of the bellows. This frame has a bar of the same thickness, and $4\frac{1}{2}$ inches wide, across the centre, as there are to be two valve-boards.

All these frames are to be put together by mitring the corners, and then cutting a groove in each, as shown in Fig. 37. They are then glued together with a tongue of oak or mahogany, *cross way* of the grain, in the grooves, thus forming a strong and air-tight joint. The tongues are shown by the dotted lines at the corners of Fig. 36. Ordinary mortise and tenon joints will not do, as they are not sufficiently strong, and if the wood shrinks at all, they are not air-tight.

Having completed these framings, now make the trunk-band, which is made of 1 inch pine $3\frac{1}{2}$ inches wide, and forms a sort of tray when glued and screwed in its place on the middle board. The outside measure of this band is 4 feet 6 inches long and 2 feet wide, being exactly the same size as the floating frame. It should be carefully dovetailed together at the corners, the holes for the wind-trunks being cut in the back of it before it is put together. The holes for the wind-trunk for the sound-board is shown in the centre, and those for the pedal wind-trunks on each side of it. It must, however, be borne in mind that the wind-trunks may be placed either at the back or at the ends of the instrument, as may be most convenient.

In a two-manual instrument having separate wind-trunks, the wind-trunk for the great sound-board is at one end, and that for the swell sound-board at the other. Only one trunk is however needed, if one just as it is, for it is nothing but a frame. The top frame should have an inch board prepared for it about 4 feet long, and 1 foot 7 inches wide, with a hole about 5 inches by 3 inches cut through the centre of it, for

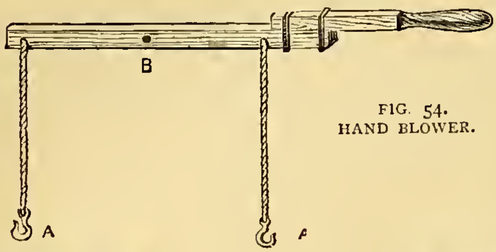


FIG. 54. HAND BLOWER.

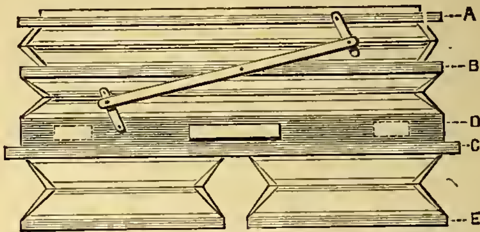


FIG. 50.—BACK ELEVATION OF BELLOWS. Scale, $\frac{1}{2}$ inch to 1 foot.

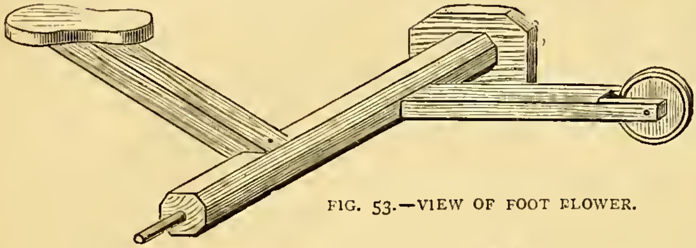


FIG. 53.—VIEW OF FOOT BLOWER.

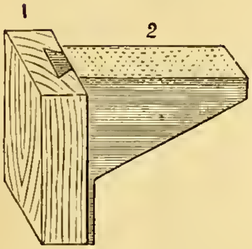


FIG. 52.—MOVABLE SUPPORT FOR RIBS.

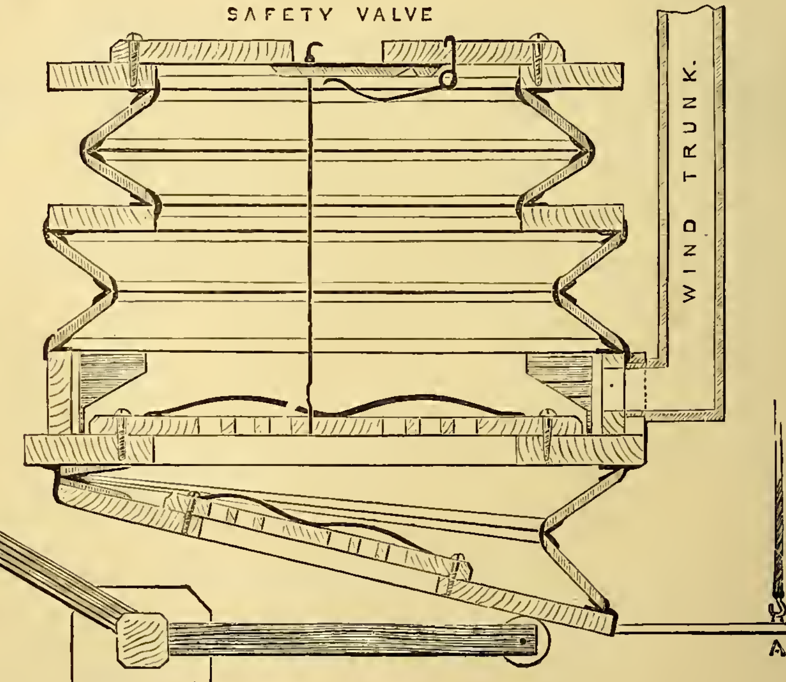


FIG. 51.—SECTION OF BELLOWS, WITH BLOWER. Scale, $1\frac{1}{2}$ inches to 1 foot.

wind-chest supplies both sound-boards. Now prepare two valve boards 2 feet long, 1 foot 7 inches wide, and $\frac{3}{4}$ inch thick, plane them very true, and then bore four sets of six holes in each, as shown in Fig. 38. The holes may be about $1\frac{1}{4}$ inch diameter, and should be made with a centre bit. The floating frame is left the safety valve. These boards will be screwed down perfectly air-tight on to their respective frames, but should not be fixed until the bellows is all complete, as it is so much easier to glue the ribs into their places when the framings only are there.

Now prepare 16 pieces of pine $\frac{1}{2}$ inch or $\frac{3}{8}$ inch

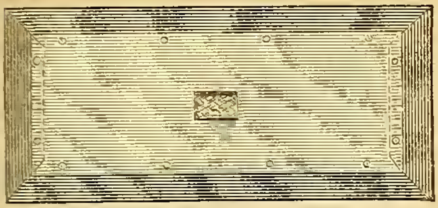


FIG. 35.—PLAN OF UPPER BOARD. Scale, ½ in. to 1 ft.

FIG. 47.—METHOD OF JOINING THE RIBS. Half full size.

FIG. 42.—PLAN OF RIBS FOR UPPER FOLD. Scale, ½ inch to 1 ft.

FIG. 36.—PLAN OF FLOATING FRAME. Scale, ½ in. to 1 ft.

FIG. 43.—PLAN OF RIBS FOR LOWER FOLD. Scale, ½ inch to 1 foot.

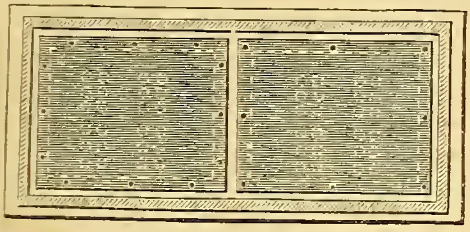


FIG. 38.—PLAN OF VALVE BOARD.

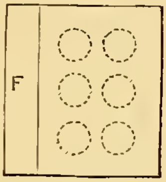


FIG. 48.—PUFF VALVE. Scale, 1½ ins. to 1 ft.

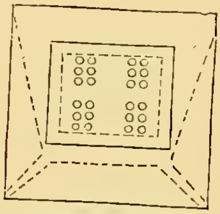


FIG. 39—PLAN OF FEEDER BOARD. Scale, ½ inch to 1 foot.

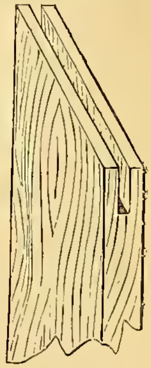


FIG. 37.—METHOD OF MAKING JOINT.

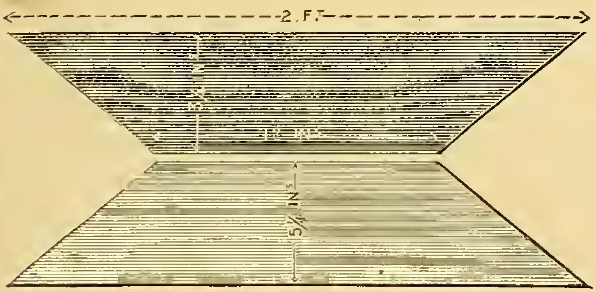


FIG. 40.—END RIBS OF FEEDERS. Scale, 1½ inches to 1 foot.

FIG. 44.—RIBS FOR UPPER FOLD. Scale, ½ inch to 1 foot.

FIG. 45.—RIBS FOR LOWER FOLD. Scale, ½ inch to 1 foot.

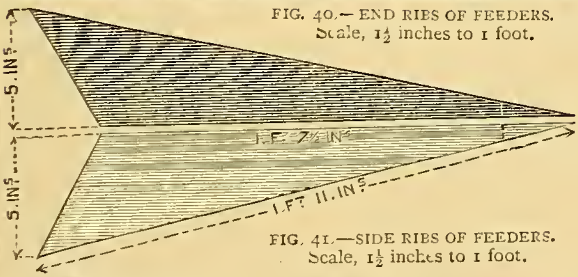


FIG. 41.—SIDE RIBS OF FEEDERS. Scale, 1½ inches to 1 foot.

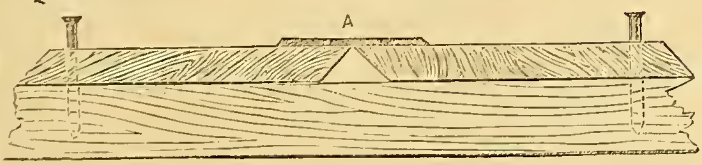


FIG. 46.—RIBS FASTENED ON BOARD FOR LEATHERING OR TAPING. Half full size.

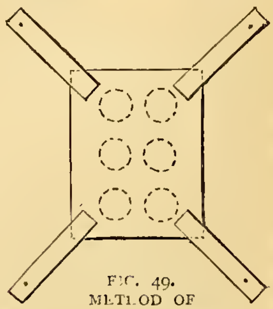


FIG. 49. METHOD OF FORMING VALVE. Half full size.

thick and 3½ inches wide, for the ribs. You will require eight long ones and eight short ones : those for the top fold are shown in Fig. 42, and those for the lower fold in Fig. 43, from which you will also get the length required. Be careful in cutting the angles to the slopes shown, or they will cut through the leather gussets when in use.

When you have cut all the ribs bevel off the edges of them as shown in the cross sections, Figs. 46 and 47. We will now go on with the leathering, etc., of the reservoir, leaving the feeders till this is finished.

It must be understood that each joint in the ribs is made by a strip of linen, or, what is better still, of Venetian blind tape on the inside and a strip of leather on the outside. You will commence by laying each pair of ribs together on a board, or on top of your bench, as shown in Figs. 44, 45, and 46, leaving a space of ⅛ inch between them, and fasten them down with a small French nail at each end, so that they cannot shift. Now glue a strip of blind-tape over the two ribs of each set in the upper fold, and a strip of leather over each set in the lower fold. for one will be the inside and the other the outside. The glue must be used thin and boiling hot, and the leather should be half-strained white sheepskin, cut into strips about 1½ inch wide, and pared down at each edge on the soft side. A very useful tool for rubbing the strips down so as to squeeze out all superfluous glue can be made by fitting a piece of thin ivory—such as is used for covering the manual keys—into a saw cut in the end of a piece of wood, about 6 inches long and 2 inches wide. The other end may be formed into a convenient handle. A bowl or can of nearly boiling water should be kept at hand, and all superfluous glue and smears wiped off the leather with a sponge.

The leather must all be glued on the soft side, and should have two or three coats. When you have glued each pair of ribs together with the strips of tape and leather, and they are quite dry, fold them together as shown in Fig. 47 (which is an endwise section), so that the tape or leather comes inside the fold. It is a good plan to place a strip of wood or cardboard about ⅛ inch thick between the lower edges of the ribs as at C, to keep them that distance apart while the next operation is performed. Now glue a strip of leather over the bevelled edges of all those that are already taped, and rub it well down on to the tape; and glue a strip of tape in a similar way on to the ribs that have been leathered. This leathering or taping is shown by the black line on the top of the bevels in Fig. 47. You have now each pair of ribs joined all along the centre by a piece of leather on the outside, and a piece of tape on the inside, and as the two ribs are ⅛ inch apart the hinge works very easily. Now see that the inside edges of the top frame and of the floating frame exactly correspond, then take some strips of leather and fold them lengthways down the centre, and glue the top half of them on to the underside of the top frame close to the inner edge all round, so that the other half of the strips hang down, and proceed in the same way with the top side of the floating frame, but leaving the upper half of the leather sticking up. Do exactly the same with the under side of the floating frame, but close to the outer edge, and also on the top of the trunk-band, but using tape instead of leather for these. When this is dry, fix the ribs into their places by gluing the other halves of these strips of leather on to the outside top and bottom edges of the upper folds, and the halves of the tape strips on to the inside top and bottom edges of the lower folds. Allow these to dry, and then glue a strip of tape over the inside of the top frame and the inner edge of the top ribs, and the same with the bottom edge of the top ribs and the inner edge of the floating frame. Proceed in a similar way with the *outer* edges of the lower fold, only of course using leather instead of tape.

The section Fig. 51 shows the positions of the tape and leather for every joint, so I think a little study of the diagram will make clear to the amateur, what it is rather difficult to describe in writing. Care must be taken not to let the edges of the ribs grind against the woodwork of the frame, but to let the leather and tape touch each other about ⅛ inch. Leaving the reservoir for the present, we will now take up the feeders.

The bottom board of each feeder is formed by a framing the same as the other boards, and each measures 2 feet 2 inches in length, and 2 feet in width. The back piece is 6 inches wide, the front piece 8 inches, and each side is 6 inches wide ; thus leaving an opening 14 inches long and 10 inches wide, which is covered by a valve board 17 inches long and 13 inches wide, to be screwed on when all is complete in the same manner as the other boards are. Each valve board to have four sets of six holes 1¼ inch diameter, to be covered by valves as described hereafter. The ribs of the feeders are to be made of ½ inch pine, the end ones being as shown in Fig. 40, 2 feet long on the longest side, and 1 foot long on the shortest, and are all 5¼ inches wide. The side ribs are triangular, and rather more difficult to set out ; they are shown in Fig. 41. First draw on a board two parallel lines, about 2 feet long and 5 inches apart. From a point at one end, set off a length of 1 foot 7½ inches on the top line, now measure a length of 1 foot 11 inches from the same point down to the lower line, and draw a line joining the two points: thus obtaining the sloping side. Join the 1 foot 7½ inch point to the 1 foot 11

inch point, and your shape will then be complete. Make four ribs like this for each feeder, and then cut off about 3 inches from the pointed ends, for these ribs must not extend right to the hinges of the feeders. Proceed with the leathering and taping of each pair of ribs in just the same way as you did with those for the reservoir. Now plane up two strips of $\frac{3}{4}$ inch pine $2\frac{1}{2}$ inches wide, and bevel them off, and glue and screw them on to the inside of the feeder boards where the hinges are to come, and fix similar pieces on to the middle board immediately over them. The feeder boards may now be hinged on to the middle board by four strips of stout webbing to each. Fasten the strips with glue and tacks, the ends to be one inside and the other outside, in exactly the same way as the webbing hinges are put on a clothes horse. Or you may bore some holes through the feeder frame and middle board, and draw some stout sash-line through and fray out the ends and glue them down, driving wedges into the holes to make a good strong job of it. In either form of hinge it is necessary to glue a strip of leather both inside and outside, along the edge of the feeder board. The ribs may now be glued into their places with strips of tape and leather, as described for the reservoir. Fig. 51 will show exactly how the joints are arranged.

The next thing to be done is to close up the corners of all the ribs by means of gusset pieces, both in the reservoir and the feeders. To get the sizes and shapes of the gussets, open the bellows until the holes at the corners show their greatest possible size, both in height and width, and cut a paper pattern to the requisite shape, which is of a diamond form, allowing it to be large enough to lay on the wood at least an inch all round. Having satisfied yourself that your pattern is the right shape, cut out the requisite number of pieces in soft leather, and pare down the edges all round. Glue them on very carefully, using boiling hot glue, or it will not hold. Rub them well down with the ivory tool, and sponge off the superfluous glue. Where the folds come in the centres of the ribs, you will have to pinch up a piece of the gussets between your fingers, and when the glue is dry, cut the pinched-up pieces off with a pair of sharp scissors. Then cut some strips of leather 4 inches long, pare the edges, and glue them over the centre lines of the ribs, so as to cover the part of the gusset that has been cut. Proceed in the same way with the gussets of the feeders.

This gluing on of the gussets needs much patience, for it is a most troublesome job, especially for the inexperienced. Cut out four small triangular shaped pieces and glue in one on each side of the feeder ribs over the gap at the hinge end, and the leathering will now be complete. Now to form the valves, take a good sized piece of sheepskin leather, and glue another piece on to it, so that the soft sides are both outside. You must not forget to scratch the grainy side of the leather with glass-paper, or the gluing will not hold. Pass a warm iron over this and place it between two flat boards to dry. When dry rub it well on both sides with a round stick to take out the stiffness, and then cut it up into pieces just large enough to cover a set of six holes with an overlap of $\frac{3}{4}$ inch all round. Now cut some narrow strips of leather and glue on to each corner of the valve, and then tack the other corner tightly down on to the valve board, allowing the valve just the least play. This valve is shown in Fig. 49, and is in my opinion the most efficient valve in use, and it never curls up, for it is held down at each corner. The ordinary puff valve is shown in Fig. 48, and is made in much the same way of two thicknesses of leather, but the upper thickness does not cover the portion marked F, which forms the hinge. This hinge is glued down on to the valve board, and a strip of thin wood is bradded over it to prevent the valve from blowing right over. This is a good valve, but it sometimes curls up, and I much prefer that first described. Before fixing the valves glue a nice smooth sheet of stout writing-paper over the valve holes, and when dry cut the holes through with a knife, and you will then have a good smooth bed for the valves to lay on.

The valve boards may now be screwed into their respective places, using round headed screws with washers, and placing a strip of leather between the joints to make all air-tight.

The safety valve is a piece of $\frac{5}{8}$ inch pine $\frac{3}{4}$ inch larger all round than the hole which it covers, and it should be lined with a double thickness of leather. The leather should extend an inch or two over at the back to form the hinge, which is glued down on to the underside of the top board, and have a fillet of wood bradded over it. The valve is kept closed by a wire spring as shown in Fig. 51, and is opened by means of a string, which is fastened to a staple in the middle board, and brought through the safety valve and knotted outside. If you allow the bellows to rise 8 or 9 inches it will be ample.

You will now see that in consequence of the way in which the bellows is made you have only to take out a few screws in order to get at any part of the interior should anything go wrong. In the old style of bellows with solid boards instead of framings, the only way to get at the valves was by ripping up the bellows, and I well remember my disgust when I had to perform that awful operation on the first bellows which I made, and the waste of time and material in repairing the damage thus caused.

The only thing necessary to complete the interior of the bellows is to put in six supports for the ribs. These are simply pieces of wood shaped as in Fig. 52, covered on the top with two thicknesses of leather, and fixed to the inside of the trunk-band, two on each side and one in the centre of each end.

In order to enable you to take out the valve boards when necessary, you must make some of these supports movable, which will be easily accomplished by making them in two parts ; the portion marked 1 in Fig. 52 to be fixed to the trunk-band, and the part marked 2 to be dovetailed into it, so that it can be slipped in or out as required.

The wind-trunks are square, or rather oblong-shaped tubes made of $\frac{1}{2}$ inch pine, and mitred at the bends. They are connected to the wind-chest or trunk-band by means of a flange plate, which is a flat piece of mahogany, about 3 inches longer at each end than the length of the opening, and about $\frac{3}{4}$ inch wider on each side than the width of it, and an opening the size of the interior of the wind-trunk is cut in the flange plate. Thus, if the outside size of the wind-trunk is 13 inches by $2\frac{3}{4}$ inches, the flange plate would be about 19 inches by $4\frac{1}{4}$ inches. The wind-trunk is halved into the flange plate, as shown in Fig. 51. The plate is screwed to the wind-chest or trunk-band, as the case may be, and a thickness of leather placed between the joints.

In order to secure the equal and parallel opening of the bellows a pair of regulators are needed. One of these is shown in Fig. 50, and it consists of three pieces of flat wood, or metal, jointed together. The long piece is centred on the floating frames, the top short piece on to the top frame, and the lower short piece on to the trunk-band. All the centres work loosely. The other regulator is placed at the front of the bellows, but the long piece slopes in the opposite direction.

The bellows, if a small one, may be made with only one feeder, if preferred, extending the whole length of the bellows, and hinged either at the front as described, or at one end. For the two-manual it would be better to make the bellows as wide as the combined width of the two sound-boards, as the larger they are the better. The instructions already given will apply just the same, the only alteration being in the dimensions.

Two views of a foot-blower are given in Figs. 51 and 53. It consists of a roller working on a pivot, centred at each end into brackets, which may be fixed to the building frame or screwed to the floor. An arm, with a little wheel at the end of it, extends from the back of the roller in such a position that the wheel comes directly under the centre line of the feeder. The wheel may be covered with an india-rubber tyre to cause it to work silently, and a strip of brass should be screwed on to the underside of the feeder frame for the wheel to work on. On the front of the roller another arm projects, sloping upwards, and it has a flat piece of wood, shaped to receive the foot, on top of it. This arm should be placed in the most convenient position for pressing with the foot. When the foot is pressed on this the other arm rises and closes the feeder, and when the pressure is withdrawn the feeder falls again. It is obvious that by altering the position of the arms the blower can be made to work either right or left of the performer.

Fig. 54 shows a hand-blower, which is required where pedals are used. It is simply a flat bar of wood or metal, centred on the building frame or other convenient place, and cords hang down at equal distances from the centre, and are hooked into staples projecting from the centre of the feeder frame.

One end of the bar is extended and formed into a convenient handle, or the handle may be made separate and slipped into a pair of staples on the top of the bar when in use, and unshipped when not required. The cords should be of such a length that when one feeder is up the other is down.

Carefully test the bellows to see that there is no escape of wind, and remedy any defects that may show themselves.

The bellows, when complete, may be painted or covered with fancy paper, according to taste, but the leather work should be left as it is.

In my next chapter I shall describe the building frame and action.

(*To be continued.*) 270

BOOKBINDING FOR AMATEURS.

By the Author of "The Art of Bookbinding."

V.—MILLBOARDS—DRAWING IN, PRESSING, AND CUTTING.

THERE are a great number of different kinds of millboards in the market, which vary in quality and price so much, that it will perhaps be better if it is left to the amateur to select what kind of board he wishes to use. But a few words about them may not be out of place. The best boards are those made from old rope and sacks : *the blacker, harder, and smoother the board*, the better. These, the amateur will find, are very hard to cut, and when two are pasted together, and are allowed to get quite dry, are almost like pieces of iron. Price, from 30s. to 32s. per cwt. A grey

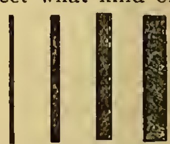


FIG. 26.—THICKNESSES OF BOARDS.

board might be classed as the second quality, and perhaps may be recommended as the best for the amateur, they being more easily cut; they are of a lighter texture, and although are not to be compared with the black boards, there is very good wear in them. Price, about 16s. per cwt. The next board is the straw, about the cheapest board we have; they are used in cheap shops, but the amateur had better not have much to do witb these. The quality of these also vary very much. Price, from 9s. per cwt. Boards are sold at any of the material dealers (Messrs. Richards, *St. Martin's Lane, W.C.;* Messrs. Eadie, *Great Queen Street, W.C.;* Messrs. Corfield, *St. Bride Street, Ludgate Hill,* and others), and no matter what thickness or quality, are sold by weigbt, so that the amateur need only buy a few sheets at a time. The thicknesses are shown in Fig. 26, and are known as sevenpenny (A), eightpenny (B), x (C), xx (D), and tenpenny. No rule can be laid down as to the exact size; the thickness and size of the book must determine the thickness of the board; but if the amateur takes the following as a guide, he will be about right: Eightpenny for thin 8vo books and 12mos; x for ordinary 8vos; xx for thick 8vos and 4tos; and tenpenny for thick 4tos and folios. The amateur may also make his boards to the proper consistency by pasting two or more boards together; but he must remember that the thin board (if he is pasting two boards of unequal thickness) should always go nearest the book. With regard to the implements employed for cutting the boards up, we have, first, the large, or boards shears, in shape somewhat like an enlarged tin shears. One arm or shank is screwed into the laying press; the other, left free, is used with the right hand, and the board to be cut is held with the left. The price is from 16s. to £1 10s. The amateur should procure one of these, otherwise he will have to cut his boards up by hand, and this he will find very laborious. In binding establishments there are millboard cutting-machines, driven by steam and hand-power; these cut the sheets up into various sizes with great rapidity.

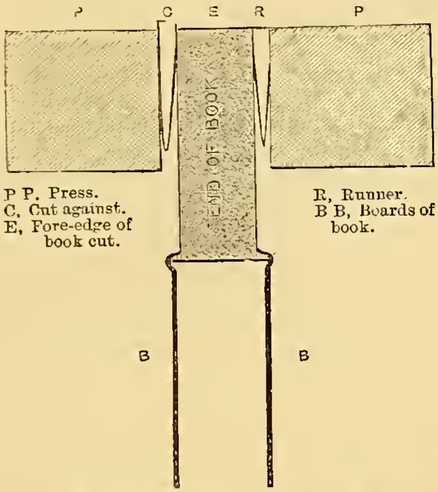


FIG. 29.—SECTION OF CUTTING PRESS, SHOWING CUTTING OF FORE-EDGE OF BOOK.

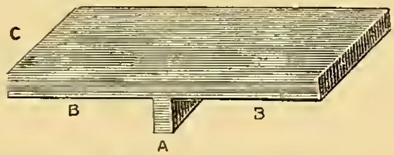


FIG. 28.—KNOCKING-DOWN IRON.

A is secured between cheeks of press; B B. rests on press; C, smooth face o i which boards are hammered.

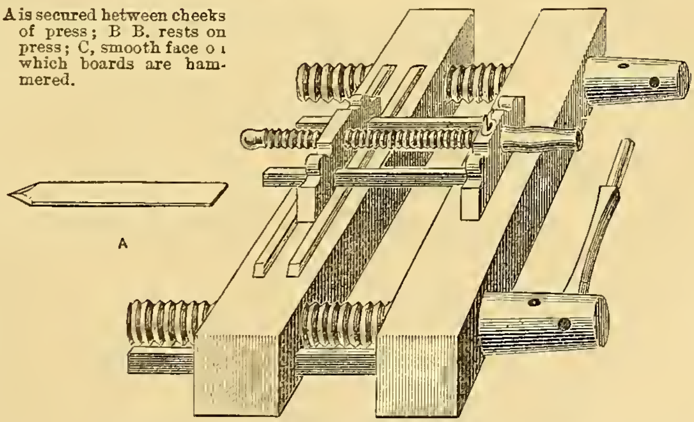


FIG. 27.—CUTTING PRESS AND PLOUGH. A, KNIFE.

After having chosen the boards, square the edge which is to go to the back of the book. This must be done in the cutting press (Fig. 27), using a cutting board for one side termed a runner, and another called a cut-against for the other side. Both, however, are called cutting boards. These are simply to save the press from being cut, and a piece of old millboard is generally placed on the cut-against, so that the plough-knife does not cut or use up the cut-against too quickly. The boards are placed on the cut-against and the edge of the runner, up to the portion to be cut off, the whole is then carefully lowered in the press, the edge of the runner being level with the edge of the press, the portion to cut off will naturally be above the press, the whole to be screwed up tightly. When cut, the other three sides must be cut to proper size. The requisite width is obtained by extending the compasses from the back of the book to the edge of the smallest bolt or fold in the fore-edge, the boards are knocked up even, compassed up, that is, a mark is made by pressing the point of the compasses in the boards, measuring from the back edge of the board just cut, the runner is placed exactly up to the compass holes, the piece is

then cut off in the press, using the cut-against as before. The head or top of the boards is next to be cut by placing a square against the back and marking the head or top with a bodkin or point of a knife ; the boards are cut as before up to the mark. The length is now taken from the head of the book to the tail, and in this some judgment is required. If the book has already been cut, the boards must be somewhat larger than the book.

Drawing in and Pressing.—The boards having been squared, are attached to the book by lacing the ends of the cord through holes made in the boards. The boards are laid on the book with their backs in the groove and level with the head, they are then marked either with a lead pencil or the point of a bodkin exactly in a line with the slips, about half an inch down the board. Holes are then made in the board with a short bodkin, on the lines made about half an inch away from the edge, the board is then turned over, and a second hole made about half an inch at right angles from the first one. The holes are made by placing the board on a piece of wood and hammering the bodkin through the board, one sharp blow is generally enough. The boards being holed, the slips must be scraped, pasted slightly, and tapered or pointed. Draw them tightly through the first hole made and back through the second. Tap them slightly when the board is down to prevent them from slipping and getting loose. When all are drawn in cut the ends of the slips close to the board with a knife, and well hammer them down on the knocking-down iron (Fig. 28), to make the board close on the slips and hold them tight. The slips should be well and carefully hammered, as any projection will be seen with great distinctness when the book is covered. Care must be taken that the edge of the hammer does not cut the slips.

The book may now be said to be ready for pressing. In page 469, Vol. I., pressing is mentioned, the only difference here being, that instead of putting the books in the centre of the pressing boards, the boards are put flush with the groove, exposing the back. A standing press is used for this work in bookbinder's shops, but the amateur will find his laying-press answer all purposes, if he uses it as explained on page 470. Screw up the press as tight as possible, but be very careful that the book, or books, are in the centre of the press.

The back of the books are now to be pasted, and allowed to stand for a few minutes to soften the glue ; then, with a piece of wood with a flat end, or the back of the hammer, the glue is rubbed off, and the backs well rubbed with a handful of shavings, and left to dry ; if the books are thick, or large, a thin coat of paste or glue is applied to the back, and a piece of writing-paper stuck on, this will impart strength to the book during the process of cutting, and other work done before covering. Leave the books in the press as long as possible ; books cannot have too much pressing : this the amateur will find out. A book that has been well pressed is always solid, and always feels better than one that is flabby and loose.

The next process is cutting ; and let me here remark that it is useless to attempt anything, unless my reader has a very sharp plough-knife. It will therefore be as well to have a small stone to hand, that the plough-knife may be touched up when blunt, it is perfectly impossible to cut a smooth edge if the knife is blunt. The knife must be straight in the plough, for if the knife is not absolutely straight, ridges will be formed, or the edge will not be straight. Having this in mind, the book may be cut by lowering the front board the requisite distance from the head that is to be cut off. A piece of thin millboard is put between the lined board and book, so that the knife, when through the book, may not cut the board of the book.

The book is now lowered into the cutting press, with the back towards the workman, until the front board is exactly on a level with the press. The head of the book is now horizontal with the press, and the amount to be cut off exposed above it. Both sides should be examined, that the book is perfectly true, as it is very liable to get a twist in being put in the press. When it is quite square, the press is to be screwed up tightly and evenly. If the press is not screwed up evenly great risk is run of jagging or tearing the paper instead of cutting. The book is cut by drawing the plough gently to and fro. Each time it is brought towards the workman, a slight amount of turn is given to the screw of the plough ; if too much turn is given to the screw, the knife will bite too deeply into the paper, and will tear instead of cutting it. The top edge being cut, the book is taken out of the press, and the tail cut. A mark is made on the top of the hind or back-board just double the size of the square, and the board is lowered until the mark is on a level with the cut top. The book is again put into the press, with the back towards the workman, until the board is flush with the cheek of the press ; this will expose above the press the amount to be taken off from the tail, and the left-hand board will be exactly the same distance above the press as the right-hand board is below the cut top. The tail is then cut in the same way as the top edge.

In cutting the fore-edge (Fig. 29), to which we must now come, always have the head of the book towards you, so that, if not cut straight, you know exactly where the fault lies. The fore-edge is marked both back and front of the book by placing a cutting-board under the first two or three leaves, as a support, then using the millboard on the book as a guide, a line is

drawn or a hole is pierced, head and tail. The book is now knocked, with its back on the press, quite flat, and trindles are placed between the boards and the book, by letting the boards fall back from the book, and then passing one trindle at the head, the other at the tail, allowing the top and bottom slip to go in the grooves of the trindles. Trindles are flat pieces of steel, in shape of an elongated U, about 1½ inch wide and 3 or 4 inches long, with a slot nearly the whole length. The object of this is to force the back up quite flat, and by holding the book when the cut-against and runner is on it, supported by the other hand under the boards, it can be at once seen if the book is straight or not. The cut-against must be put quite flush with the holes on the left of the book, and the runner the distance under the holes that the amount of square is intended to be. The book being lowered into the press, the runner is put flush with the cheek of the press, and the cut-against just the same distance *above* the press as the runner is *below* the holes. The trindles must be taken out from the book when the cutting-boards are in their proper place, the millboards will then fall down. The book and cutting-boards must be held very tightly, or the book will slip. When quite square, the press must be screwed up tightly and the fore-edge ploughed. The book when cut should have the same curve in the fore-edge as the back, and if cut truly, there will be a proper square all round the edges. This method is known as cutting in boards.

Cutting out of boards is done when the book is cased; the cutting is done when the book is flat or square, that is before it is rounded, and as the first Volume of this magazine is now complete, and should the amateur binder wish to bind his copy in the case or cover supplied by Messrs. Ward, Lock, and Co., he can do so by buying his case from them, then getting his copy collated. As far as I can see it will not be necessary to refold the sheets, they appear to be all right, at least I can speak of my own copy; follow the directions given for beating or pressing down to gluing up; the book must now be cut, the size taken from the case with a pair of compasses; take the exact size of the boards from the back edge to the front edge of the board, this will give the exact size for cutting the fore-edge. Great care must be exercised that the book is perfectly square when in the press, or the book will not be cut straight. Of course, the runner and cut-against must be used, placing the runner to the marks made by the compass and level to the press. When cut, the book must be rounded, the size, head and tail, is again taken from the case, allowing for squares, head and tail, when cut; the book is backed as explained in page 39, Vol. II.; it may then be cleaned off in the press, placing boards into the grooves and allowing to get dry. Case books are not cleaned off in binder's shops, the price as a rule, not allowing for any more work done than is absolute necessary. When dry, a piece of mull, bought at any material dealers at a few pence per yard, is glued on the back. Place the book in the press, glue the back all over, place a piece of mull on the back, allowing it to fall over about 1½ inch each side of book, glue the mull that is on the back again, and place a piece of brown paper or writing-paper on the back, and rub down well with a thick folding stick; allow this to dry, and when dry, cut off the overplus of paper from the sides, but leave the mull this is used for pasting down; cut off both paper and mull flush with head and tail. I have not said anything about colouring the edge, this will form my next paper, but should be done when the edges are cut. The book is now placed on the case, the squares level all round, the projecting leaf to the end-papers is now torn away, the whole pasted, and the board laid down on the book, pressing it into the joint or groove when laying down. The book is now turned over, the other side treated the same way; pressing boards are placed back and front of the book up to the groove or joint of the case, and the book put into the press and left to dry. If these directions are followed, my reader will have a fairly bound copy of AMATEUR WORK, quite as strong as any case book turned out of a binder's shop. My readers must by this time understand that *case work* cannot be as strong as *in board work*.

(*To be continued.*) 271

THE VIOLIN: HOW TO MAKE IT.

By EDWARD HERON-ALLEN.

I.—THE WOOD AND TOOLS USED IN FIDDLE-MAKING.

I HAVE now enumerated at length, in the preceding series of articles on "Violin-Making: As it Was, and Is," the scientific principles on which every good fiddle must be constructed, together with much matter of interest to the world of violinists at large, I am now going in detail into the practice of actual fiddle-making, and hope to be understood by my readers in proportion to the amount of pains which I have taken to render myself so. I shall proceed as if I were actually working with the reader, and he were using my moulds, models, and tools, with a view to which I have given outlines of all the former actual size, so that they need only be traced or cut out and pasted on slips of wood for immediate use. By way of introduction I give in this chapter drawings and descriptions of all such tools as are peculiar to the

fiddle-maker's atelier, which must be high and light. The mould I have chosen, and which will be represented in a Supplement to be given with the next Part of this Magazine, is of the best shape of Stradivarius, and all the outlines (neck, scroll, *ff* holes, etc.), which are also reproduced actual size, are those which go with this mould, being most carefully and accurately taken from the same fiddle. It must be observed that there are two ways of doing many of the operations by which a fiddle grows under our hands ; and if time and space will allow, I shall embody these into a supplementary chapter after we have worked through the whole process, and, if it is considered desirable to do so, give another Supplement, this time *an inside mould* of *Guarnerius*, with its models and outlines in facsimile.

One of the great considerations of the practical science of fiddle-making is that of the tools. Many of these are what are to be found in any cabinet-maker's shop, such as saws, planes, chisels, etc., of the ordinary patterns ; but there are certain original tools and modifications of the common ones which must form part of the *lares* and *penates* of the fiddle-maker, and it will be to the consideration of these that we are now about to turn our attention. Firstly, then, for the common tools, a large saw, a tenon saw, and a bow saw of the ordinary forms are required ; a long or trying plane, a small or smoothing plane, and a set of carving gouges and chisels. The workshop must be fitted with an ordinary bench with a vice affixed to it, shelves for reception of wood and other massive miscellanea, and racks for tools and small objects, bottles, and other paraphernalia, which in well arranged confusion furnish the fiddle-maker's workshop. Rules and T-squares of ordinary dimensions are also required, and I always carry in a leather case in my pocket a small 3-inch rule, divided to $\frac{1}{96}$, $\frac{1}{80}$, and $\frac{1}{64}$ of an inch, with a pair of spring bows for fine measurements and calculations. One rule should have a perfectly true edge of steel or some other hard substance, for the purpose of trying edges and surfaces.

You will want a pair or so of common iron cramps, (Fig. 1), for fixing wood, etc., to the bench when in use. A small bench-vice, such as can be quickly screwed on and off the bench, is frequently needed, as also is a medium-sized hand-vice. The ordinary whetstones and sharpening media must be provided. A glue pot of the common sort will do, but I like one made of copper enamel as cleaner. Many violin-makers use the best Salisbury glue, but to my mind none is better for our purpose than that which comes over in thin light brown leaves from Cologne. An ordinary cutting and marking gauge will be required, and also a set of files of the sections shown at Fig. 12. The only hammer you will want is one of the light small hammers used in joining fretwork or carvings, such as is used by watchmakers for rough work.

We now arrive at the consideration of the tools peculiar to our art which is necessary to have ready to one's hand before commencing to work, and these I shall enumerate and describe in the order in which they are mentioned and required in the following chapter on the actual manual labour required in fiddle-making.

1. *The Toothed Plane.*—This is a small iron plane, like what are known as the ordinary American planes, whose edge, instead of being smooth like an ordinary plane, is toothed or serrated, as in Fig. 8.

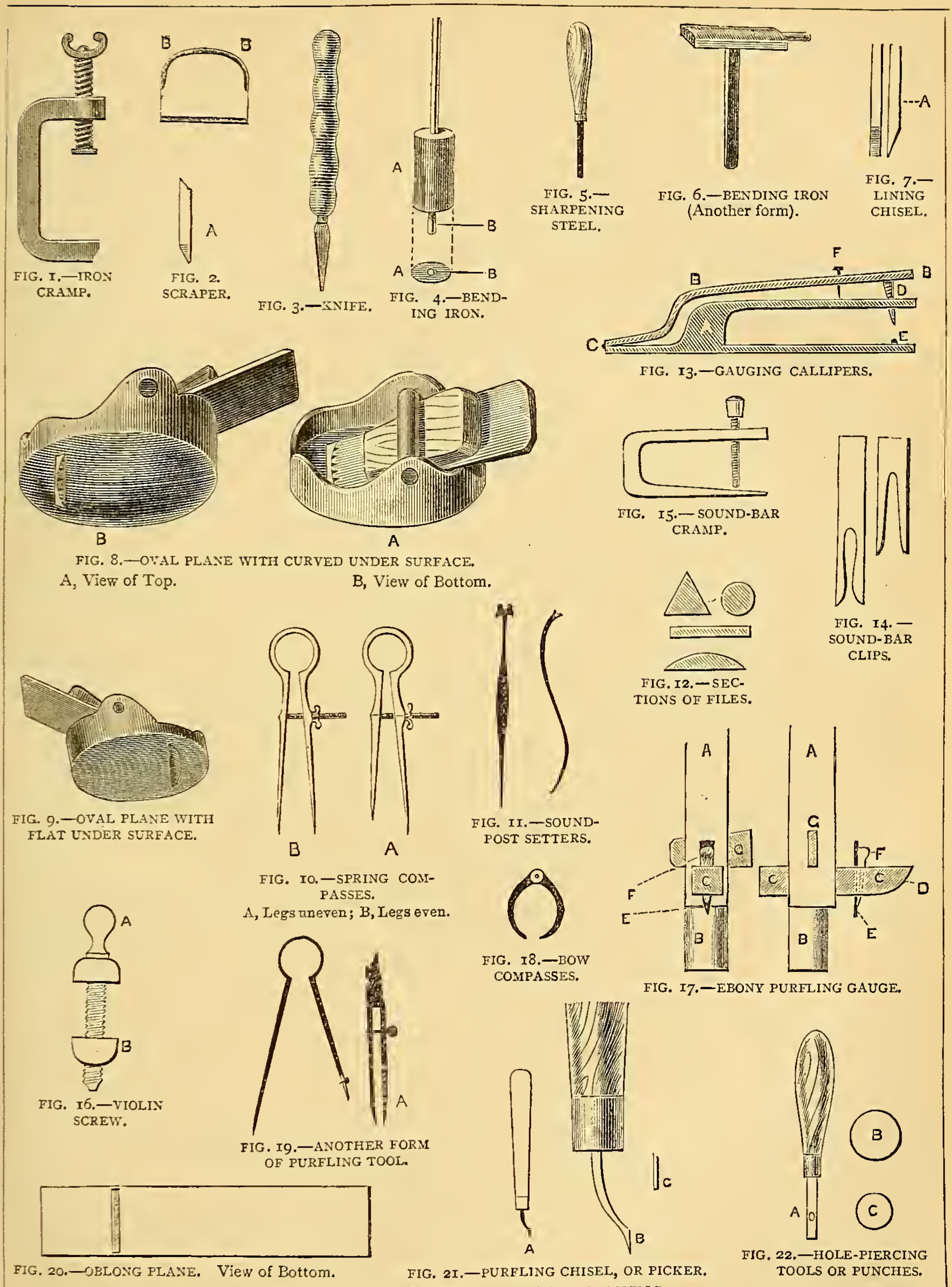
2. *Scrapers.*—These are small pieces of steel plate, shown in Fig. 2, three inches broad, whose upper side is rounded at the corners, whose lower side is kept quite straight and flat. Several should be prepared, and they must be kept very sharp, being held in a hand-vice whilst being ground. They are sharpened by bevelling one side as at *a*, along the flat side, and round the curved side as at *b b*, for getting at places inaccessible to the flat side. If preferred, and to obviate the danger of cutting the fingers by holding the side not in use, instead of sharpening the flat and curved side of each scraper, some may be sharpened on one side and some on the other if you have plenty. During use they are kept keen by means of a sharpening steel, Fig. 5, which is a round plain bar of steel, $\frac{1}{2}$ inch in diameter, set into an ordinary handle. To re-set the edges it is drawn strongly down the flat side and then down the bevel, repeating the process once, when, unless the steel wants re-grinding, it will be found to have altered any slight bluntness of the scraper.

3. *Knives.*—Two or three of these must be at hand, fixed in good strong handles. Their blades should be fine and well tempered, and they must be kept thoroughly keen, Fig. 3.

4. *Marking Point.*—This is merely a bradawl sharpened to a fine point for marking exact outlines with, which would be difficult with a pencil.

5. *The Bending Iron.*—This is used for bending the sides, and though called a " bending iron," like a " soldering iron " it is best made of copper. It is formed (Fig. 4) of a bar bearing at one end the oval mass *a*, at the end of which is the narrower round piece *b*. The object of this shape will appear later on. Another and perhaps better form is represented at Fig. 6, and is crutch-shaped. It is fixed in a hole in the bench when in use.

6. " *Lining* " *Chisel.*—This is used in letting the linings into the blocks, and is an ordinary chisel, only $\frac{1}{16}$ of an inch broad, as in Fig. 7, sharpened to a long edge, as at *a*.



SPECIAL TOOLS USED IN VIOLIN MAKING.

7. "*Oval Planes.*"—A set of these will be required for finishing the model or arching, and the scooping out of the back and belly. They must be in three sizes, the largest and smallest of which are represented actual size by Figs. 8 and 9, there being also an intermediate size. You will want two of each size, one of each size having the under surface plane as in Fig. 9, and one of each size having the under surface curved as in Fig. 8. The edges of the irons, as will be seen, must be toothed, the brittle nature of the maple and the tenderness of the pine rendering this necessary.

8. *Spring Compasses.*—You will want two pairs of these, as at Fig. 10, one pair having one leg *just* longer than the other as at A. The other ordinary as at B.

9. *f Hole Piercing Tools* or *Punches*—These are two punches, represented at Fig. 22, and used for piercing the round holes at either end of the *ff* holes, and are therefore of two diameters, indicated at B and C in the figure. They are hollow cylinders of steel, having the open end ground to a fine circular edge, and having, about an inch up the bore, a round hole in the side A, whence to pick out any chips of wood, which would otherwise, by filling them up, choke the punches.

10. *Gauging Callipers*—Fig. 13—are what are used for determining the thicknesses of the back and belly. They consist of a frame A, somewhat like that of a fret-saw and a moveable arm B, which is attached to A by a hinge C. This arm carries a metal plate D marked with sixteenths of an inch down the straight side, which passes through, and work in, a slot cut in the upper arm of the frame A, and which is of such a length that when the arm B is shut close down on to A, the tip of the plate D just touches the ivory stud E, set on the lower arm of A. The tip of D can be set and maintained at any required distance from E (as marked by its own scale), by screwing the screw F, which permits this distance to be adjusted very exactly and accurately.

11. *Violin Screws*—Fig. 16. These are used for fixing the back to the sides and the belly similarly. They are made of wood, and about three dozen, varying a little in size, will be required.

12. *Sound Bar Clips*—Fig. 14. These wooden contrivances, strongly resembling clothes-pegs, are used to keep the bar in position in the belly when being fitted. A pair must be provided.

13. *Sound Bar Cramps*, are wooden screw cramps, Fig. 15, which are used to fix the sound bar in position when glued into the belly. Three or five are used in cramping a bar into its place.

14. *Bow Compasses*—Fig. 18—are required for copying and registering diameters when working from a model. They are principally used when chiselling the head.

15. *Purfling Gauge.*—This (Fig. 17) is an ebony gauge composed of an ordinary stem A, rounded at one side as at B, which bears a sliding beam C, one end of which, bearing the cutter E, and its wedge F, is rounded as at D. The cutter E is made fast at any distance from the stem A by knocking the wedge G into the opening cut to receive it. It is used for tracing the lines of the purfling round the edge.

Another form of purfling tool shown me, and recommended by Mr. Hill, is represented at Fig. 19, and its object and construction will be readily understood by looking at the cut. Doubtless it is very certain, but it lacks the "sympathy" (if I may be allowed the expression) of the ebony one, Fig. 17, as it goes round the edges of the fiddle.

16. *Purfling Chisel* or *Picker*—Fig. 21.—The shape of this is shown at A, and enlarged to actual size at B, C shows the breadth of the blade. It is used for picking out the wood between the cuts or tracing made to receive the purfling.

17. *Oblong Plane.*—This, which is represented almost actual size by Fig. 20, is made entirely in steel, and is used more properly for bow-making, but you will often find it very useful during the course of your fiddle-making.

These are the special tools required for the actual building of the fiddle, others which are used only for the fitting up and repairs will be described and figured in the chapters devoted to these subjects.

I gave, at the request of various correspondents, the prices of various tools they specially wanted in an early chapter. This was by no means complete, as will be seen by the subjoined list. I have now made arrangements with Mr. W. E. Hill of 72, *Wardour Street*, *London*, *W.*, to supply at the prices quoted, all the tools required in the following chapters and described in this. He has also consented to supply my readers with wood from his own magnificent and well seasoned store, as follows :—

WOOD.

		s.	d.		s.	d.
Maple block for neck and scroll	from	0	6	to	2	0
Ditto with cut scroll	„	2	6	to	6	0
Maple for back	„	2	6	to	10	0
Maple for ribs	„	0	6	to	2	0
Swiss pine for belly, bass-bar, sound-post and side-linings (complete)	„	1	6	to	5	0
Purfling, enough for one violin . .					0	6

TOOLS SPECIALLY REQUIRED FOR FIDDLE-MAKING.

		s.	d.
Oblong steel plane, toothed iron . . .		8	0
Steel-scrapers (Fig. 2) . . .	the pair	2	0

Sharpening steel for ditto (Fig. 5)		1	6
Small chisel for linings (Fig. 7)		1	0
Spring-compasses (Fig. 10)	per pair	3	6
Sound-post setter (Fig. 11)		1	0
Gauging callipers (Fig. 13)		7	6
Ditto simpler		3	6
Violin-screws (Fig. 16)	the set of two dozen	12	0
Bow callipers (Fig. 18)		2	6
Purfling chisel (Fig. 21)		1	0
Knives, one large one small (Fig. 3)	per pair	5	0
Marking point		0	6
Bending iron (Figs. 4 and 6)	each	7	6
Oval planes (Figs. 8 and 9)	each	5	0
The set of three		15	0
Files, various (Fig. 12)	each	0	9
Sound-bar clips (Fig. 14)	each	0	9
Sound-bar cramps (Fig. 15)		2	0
Purfling gauge (Fig. 17)		12	0
Purfling compass (Fig. 19)		7	6
Small steel plane (Fig. 20)		3	6
ff hole piercers (Fig. 22)	the pair	10	0

The entire set £4 10s.

As it is no part of a violin-maker's trade to sell tools, and more than a great favour to part with his well selected and seasoned wood, which cannot be got, except at a violin-maker's of the first class, I beg here to offer Mr. Hill the sincere thanks, both of myself and of my readers, who are thus saved much trouble, and whom I thus know will be working with the same tools as myself.

(*To be continued.*)

OVERGLAZE PAINTING ON PORCELAIN.

By AURELIO DE VEGA.

III.—MEDIUMS—PIGMENTS—SLAB AND MULLER.

MEDIUMS.—30. These are requisites, and upon the kind used and upon their quality depends, to an extent greater than is generally supposed, the appearance of the finished work. The mediums are, as their other general name of vehicles indicates, the carriers of the paint, the means by which it may be spread.

31. *Unsatisfactory Mediums.*—Several things have been tried from time to time as vehicles, in fact, pretty well everything that, having some substance of its own and being adapted to be smoothly spread, would hold the pigment in suspension. Thus we find among those not unfavourably mentioned occasionally, glycerine, syrup of the "golden" variety, and gum. The thinning agent for use with these is water. Now, glycerine is a very good thing in its place, as, for instance, when used in moderation for keeping water colour moist or for chapped hands, but it is certainly not in its proper place when on the china painter's palette. Water, when mixed with glycerine or syrup, evaporates very slowly, and the painting would be constantly liable to be smudged. Moreover, the saccharine uncrystallizable portion of the medium would be very likely to boil up in the muffle. Gum, when dry, will, under heat, pulverise and mix with the paint, producing an unsatisfactory appearance. I recommend therefore that all such mediums as these be avoided.

32. *Satisfactory Mediums.*—The mediums which are in general use and give every satisfaction, are of two kinds—a spirit and an oil; the latter being the vehicle proper, the former, the thinning agent to render practicable the spreading of the mixed oil and paint in a coat of any desired depth or thickness. The spirit and the oil are both either of turpentine or of tar—spirit and oil of turpentine being used together, and spirit and oil of tar.

(*a.*) *Turpentine.*—Ordinary spirit of turpentine is, I think, too well known to require description. It is procurable at any oil shop at about 1d. a gill in small quantities, and is what house-painters use in mixing their oil colours. This kind is not, however, always to be recommended for painting purposes, as frequently it contains impurities, and has more or less of a tone or tint about it. The right kind for painting is the rectified spirit to be procured at an artist's material shop, where the price will probably be sixpence for a little bottle holding about 2 ounces. This spirit is as clear as the proverbial crystal, and as limpid as the purest water, and when fresh, is colourless and does not present the slightest trace of oil or water. This kind, and this only, should be used in painting. At the same time the common turpentine, when quite clear, and clean, and white, answers very well, as has been noticed in Sec. 28, for washing the brushes and palette with, and for removing paint from the palette knife, etc. The oil of turpentine is also known as fat oil. It is viscid, much of the consistency of golden syrup, and has something of the colour of clouded amber. This may be purchased at 6d. or 8d. a small bottle, but it may also be prepared from turpentine by the amateur, thus :—Into a saucer—the flatter the better—pour a little spirit of turpentine, say from a dessert to a small tablespoonful, according to the size and flatness of the saucer, and over the saucer place a layer of muslin, sufficiently close in texture to prevent dust getting to the turpentine, and yet not so close as to prevent evaporation. A very good plan is to place the saucer, mouth down, on the muslin, and cut the latter with a ¾ inch margin, then make a narrow hem in the muslin, into which may be run a piece of round elastic, this should then be drawn sufficiently tight to

catch well over the edge of the saucer. The arrangement is shown in Fig. 21. The saucer with its turpentine should then be put in a place where evaporation will be free. It should not, however, be put over the fire or a stove so as to hasten the evaporation, or the heat might dissipate the whole. When the spirituous part of the liquid has passed off there will be found left the oil at the bottom of the saucer. Fresh spirit may be added, and the process repeated until there is enough oil to pour off.

(*b.*) *Tar.*—The spirit of tar is in two shades—one a rich amber, the other a dark brown, but both are alike in nature. The oil of tar corresponds to it in the same way as the oil of turpentine does to the spirit of turpentine. The spirit and oil of tar are of similar use to the other spirit and oil, and are employed principally by those who object to the vapour of the turpentine as causing headache or affecting the throat.

The spirits of turpentine and of tar are extremely volatile, the former being somewhat more so than the latter; and during the working, sufficient may pass off to render the paint somewhat troublesome to deal with. This difficulty is, however, only a slight one, and is easily overcome by the use of a little

(*c.*) *Oil of Lavender*, or oil of spike, as it is sometimes called. This is a perfectly volatile and fluid oil, but very much less volatile than either of the abovementioned spirits, and a small quantity is added to the other mediums used when it is desired to keep the work *open*, that is—to counteract its drying or fattening through loss of spirit.

Caution.—Fat oil is not entirely free from one of the objections raised above, to the use of the mediums regarded as unsatisfactory, inasmuch as it too will boil up, or blister, or blib, or spit, if used in excess; but in this case the remedy is easy: 1, not to use too much; 2, if much must be used, it can, while fresh, be easily evaporated to dryness with the exhibition of moderate heat.

Boiling Up.—It may here be explained that the result of boiling up, when there has been too much oil mixed with the paint, is that rough, jagged, or broken-blistery appearance, which is similar to that presented when a glaze has been subjected to a greater heat than it was made to bear, and which may often be seen on common goods. The boiling oil bubbles and raises a thin film of paint. The paint subsides to the edge of the bubble, and when the latter bursts there is left a rough-edged hole, with but little if any paint within its edge, but with too much round it.

33. *The Mediums should be kept in bottles with closely-fitting stoppers*, especially the spirits, as otherwise these would quickly become "fat" by evaporation. For general purposes, corks are preferable to glass-stoppers. The plan I have found best is, on getting a new bottle of turpentine, immediately to decant the whole into small bottles. When a large bottle is only half full, the oxygen of the air in it attacks the turpentine with the formation of water and resin. The most useful are little drop bottles, like those in which homœopathic medicines are usually put up, and which are furnished with a little spout.

PAINTS.

34. *General Composition.*—The colours used in painting upon china or earthenware are, for the most part, oxides of certain metals. In only a few cases are the metals in a simple state used, those principally so employed being gold, silver, platinum, and copper; and these are so used only when the natural sheen of the metals is required, or in bronzes. The metal oxides having been rendered as nearly chemically pure as possible, are either singly or two or more in combination, and in the form of a powder intimately mixed with triturated colourless glasses of varying composition, according to the nature of the oxide and the degree of hardness required in the pigment. The mixture, as ready for use, is an impalpable powder.* When this mixture of coloured oxide and colourless glass is, with the aid of the mediums which have been described, properly applied to the glazed ware, and the painted ware gradually raised to a certain degree of heat in a specially constructed kiln called a muffle (a short notice of one description of which is given in Vol. I, page 186), the glaze of the ware, which we have seen to be a modification of glass, and the glass forming part of the mixture, both soften sufficiently to enable them to coalesce, and in this increased thickness of glaze, the colouring matter is, in the large majority of cases suspended, and in particles so fine as to be separately discernible only in thin films under the microscope. A few colours, however, such as the deep transparent blues, and yellows from one source, are really, to a certain extent, stained glasses, the glass having more or less completely dissolved the colouring matter. China or enamel colours then, from their containing, as an essential constituent, a glass or flux of vitrifiable composition, are called *vitrifiable pigments.*

35. *Home Manufacture of Colours.*—In this connection I may notice a question which has not unfrequently been put to me, viz., whether an amateur cannot make his own pigments. The answer is that in general it is quite possible for him to do so, but whether it would be a profitable undertaking is quite another matter. The conditions essential to the production in all their perfection of some of the most

* On the more particular composition of china colours, as affecting their tints in combination, I shall have to speak in a future paper, when treating of colours arising from mixture.

beautiful colours are such as are not attainable except with a very large expenditure of money, and in circumstances which do not exist in private houses or even in ordinary workshops. In such cases the requisite expenditure could only be profitable with production on an extensive scale and where part of the necessary "machinery" is utilisable for other purposes besides mere colour-making; and the circumstances, which include, among other things, the obtainment, perception, and maintenance to a nicety of different definite degrees of heat in furnaces of special adaptation are not to be found united except in factories devoted to the business.


FIG. 21.—SAUCER FOR PREPARING OIL OF TURPENTINE.

(*b*) *Flux.*—But these are not the only considerations. A very great difficulty in the way of attaining *perfect* success in colour-making is the adjustment of the flux. Indeed, it is scarcely too much to say that this constitutes the nicest and most delicate part of the whole process. (1) The flux should be suited to the pigment as regards the composition of the latter; (2) it should be proportionate in quantity to the pigment according to its nature; (3) it should uniformly cohere with the glaze of the ware beneath; and (4) the different fluxes, whatever their composition, should always vitrify at one uniform temperature. The degree of nicety to which this adaptation must be carried will be appreciated when it is stated that an excess in one of the ingredients only amounting to between ·3 and ·4 per cent. of the flux may destroy the colour.

Speaking generally, then, it is not to the amateur's interest to endeavour to be his own colour-maker. To expend pounds on a furnace when for as many shillings he may get as much colour as will in the ordinary way last him for some years, will not *pay*. Of course there are a few colours which may be made at home, but even as to these I am inclined to doubt that the domestic manufacture of them would be profitable except as a pastime, seeing that those most easily made are among the cheapest. There are published recipes on the subject which may be consulted by the amateur desirous of trying his hand in this line; but apart from the consideration that some are scarcely intelligible in modern strictness, and others are known to be incorrect, I think I have said enough to show that, except in a few cases, *le jeu ne vaut pas la chandelle.*

FIG. 22.—FORMS OF MULLERS.

36. *Employment of Different Makes in One Painting Unadvisable.*—The point (4) noticed in the last paragraph but one demands further attention as bearing greatly on a very practical consideration. It is essential hto te "finish" of a picture that after the firing all the colours should be *equally* glossy and should have equally and completely adhered to the glaze of the ware. This end, so far as the painter is concerned, is, as a rule, to be attained by the use in any one painting of the colours of *only one* maker. It is the fact that there is one recognized standard of heat for firing enamel colours, and at this heat, technically known as "rose-colour" heat, the colour should be developed in all its perfection; but, unfortunately, it is not always the case that colours of *different* makers will fire properly at one heat. In these circumstances it is with pleasure and confidence that I recommend for general use the colours which I now employ, after an experience of those of three other makers, viz., those of the manufacture of Messrs. Hancock & Sons, *Worcester.* Of these I cannot speak too highly. The grinding of them is complete, they do not concrete, they all vitrify and develop equally, and, a not unimportant point as regards price, the quantity in the No. 2 sized bottles compares very favourably with that offered by other makers.

37. *Dry v. Moist Colours.*—These are now issued in the forms of dry powder, oil medium paste, and moist water-colour. The relative worth of dry and oil-paste colour has been much debated, but it is sufficient to say, that while it must be conceded that there is on first opening a *fresh* tube of colour mixed with an oil medium, some advantage in respect of convenience, it is undeniable that in every other respect the advantage is on the side of the powder colour. I cannot do better than give some of the "reasons" of the firm for originally deciding upon powder colour:—

"I. Professionals know from experience that the sooner colours are used and fired after mixing with oils, etc., the brighter and better they will be when fired.

"II. Dry colours may be mixed thick or thin as they are required; whereas, if tubes are used and the colour is too thin, it is difficult to make it stiffer for any particular purpose," without at the same time running the risk of having the mixture too fat. [A. de V.]

"III. Colours kept in tubes are apt to separate

from their oils, if kept any length of time, thereby necessitating the trouble of re-mixing with a palette-knife (as much trouble as mixing in the first instance).

"IV. There is considerable uncertainty in producing, by mixture of various tube colours, a given tint, for grounds, etc., particularly for large work, as they vary in consistence, and are therefore difficult to measure; whereas, the proportions of dry colours may be correctly weighed, and if a memorandum is kept, the exact tint may be reproduced with certainty, without further experiments.

"V. Moist colours in tubes are apt to become in time, what is technically termed 'fat,' which makes them liable to blister in the fire. Dry colours may be mixed with as little fat oil as experience proves necessary for the particular kind of work in hand, and the artist has it in his power to render them 'fat' or 'cutting,' according to the requirements of his work, at the moment."

It is claimed too that the purchaser of dry colour has this further advantage: that he obtains so much of the dearer pigment in place of the cheaper medium; and certainly, taking quantity for quantity, a comparison of the prices of the No. 2 sized bottles with those charged by other makers for moist colours, fully supports this claim, and this should be a leading consideration with the amateur, who may save not only the maker's cost of mixing, which is a very simple operation, but also his interest on such cost.

I may add to the foregoing "reasons," that in a foreign moist make which I have used, I have found tubes from which it has been impossible to express the paint, which had become as hard as a rock.

38. *English* v. *French Colours.*—These colours, moreover, answer as well on French soft ware as on the ordinary English ware. I cannot, however, say that the French colours will fire equally well on both kinds of ware, as many of them, especially those known as the gold colours (carmines, purples, etc.) I have found signally fail on English ware, as generally fired. It is to be borne in mind, that in the muffle some articles must necessarily be nearer the sides and top than others, and such are exposed to a greater degree of heat, and in my experience are, more often than not, slightly overfired. Now, a very slight excess of heat is sufficient to entirely spoil many of the particular colours referred to; and the fact (which was first brought home to me in a piece of work, in which, in my quondam simplicity and reliance on the *bona fides* of the vendor, I employed English and French pigments of different colour, but similar composition) I afterwards fully tested on test tiles with the same result, viz., that while the English colours stood the fire, the French ones were overdone. Others of the French colours are not open to the same objection, or not so to the same extent; but for the reasons already given it is unadvisable to mix the makes in a single painting.

39. *Complete Palette.*—The following is Hancock's Complete Palette. The prices are for No. 1 sized bottles—

	s.	d.
Black.		
Soft	0	10
Deep	0	10
Blue.		
Azure	0	8
,, Deep	0	8
Old Tile	0	8
Turquoise Outremer	2	0
,, Soft	1	0
,, Schwartzenburgh	2	0
Bronzes.		
Various Tints, per dwt.	4	0
Brown.		
Austrian	0	9
Brunswick	0	9
Chesnut	0	9
Chocolate	0	9
Fawn	0	9
German	0	9
Golden	0	9
Olive	0	9
Sepia	0	9
Vandyke	0	9
Carmine.		
Carmine		
Pink	1	0
Rose Coral	1	6
,, Du Barry	3	0
,, Ordinary	1	0
,, Strong	1	6
Enamel Glazing or Flux	0	4
Gold.		
Prepared . per dwt.	5	6
Paste for raised Gold	0	9
Green.		
Blue	0	8
Celadon for grounds	0	10
,, Hard	0	10
Deep	0	8
Dover	0	10
Emerald	0	10
Green (*continued*).		
Gordon	0	10
Rose-leaf	0	10
Sèvres	0	10
,, Light	0	8
Shading	0	8
Grey.		
Black	0	10
Pearl	0	9
White Shadow	0	9
Orange.		
Dark	0	8
Light	0	8
Opaque	0	8
Strong Deep	0	8
Purple.		
Ordinary	1	8
Royal	3	0
Ruby d'Or	3	0
Red.		
Flesh, Nos. 1 and 2	0	9
,, Shadow	0	9
Ordinary	0	9
Salmon, Nos. 1 and 2	1	0
Scarlet	0	9
Silver.		
Prepared . per dwt.	2	6
Violet.		
Lilac, Nos. 1, 2, and 3	1	0
Mauve	1	0
Violet	1	0
White.		
Hard	0	10
Medium	0	10
Soft	0	10
Yellow.		
Buff	0	8
Ivory	0	10
Light	0	8
Opaque	0	9
Persian	0	9
,, Hard	0	9

Small bottles may be had of ordinary purple at 1s. 2d.; Outremer and Schwartzenburgh turquoise at 1s. 4d.; and royal purple, Ruby d'Or, and Rose du Barry at 2s.

The No. 2 sized bottles contain twice the quantity at one and a half times the price.

Sets of these colours are procurable in boxes of 12, 16, 20, or 30; but the amateur may, with great advantage to himself at first, and with prospect of greater and more speedy success subsequently, confine himself to the use of two or three.

40. *Moist Oil-colours.*—Thus far of powder colours, and the reasons for the use of them in preference to colours ground with an oil medium. At the same time, it cannot be ignored, that no matter how theoretically correct the adoption of a certain course may be, there are many to whom personal convenience is a prime consideration; and if there be any such among my readers, I may state, for their benefit, that Messrs. Hancock and Sons issue also oil-colours in tubes. I do not wish to suggest that these colours are entirely free from all the objections noticed as obtaining against such colours, but they have this in their favour—that they do not "fatten," and they do not harden, the two principal sources of waste and loss. The first result follows from the use in their preparation of the special medium mentioned in Sec. 32 (*d*) above.

41. *Moist Water-colours.*—I come now to a subject which has been engaging attention for very many years, viz., the preparation of a moist colour, which, while being adapted to use with *water* as a diluent, should yet be without the disadvantages attending the employment as mediums of the articles noticed in Sec. 31 as objectionable, or any similar ones. This end has now been completely achieved, and in Hancock's moist water-colours we have a preparation very like moist water-colours for ordinary water-colour painting. This make is only just issued, and the successful production of it certainly marks an epoch in the history of ceramic colour making. We saw above that the evils of the rejected mediums were the possibility of loss of work through smudging, the probability of boiling up, and the certainty in gums of efflorescence. These evils are altogether obviated by the medium with which the new colours are prepared, and which is supplied with them. It is a megilp, *already completely decomposed* by a special process, so that the sole action of heat upon it is to dissipate it without prejudice to the pigment; and as a preliminary slight heating of the painting dries it, there is no possibility of smudging. On the use of these colours I shall speak in my next paper, when dealing with the mixing of colours for use; at present I confine myself to noticing the

42. *Utility of the Make.*—(*a.*) I have just noticed some of the advantages arising from the medium. There is another most important one, viz., that there is no waste. At the moment of going to press I have on my palette some of this paint which has been lying there for nearly two months, and it is now as good and utilisable as when it first issued from the tube.

(*b.*) The use of the paints is not attended by the discomfort felt by many when employing turpentine or tar.

(*c.*) By several this will certainly be deemed to be a cleaner paint.

(*d.*) The great drawback experienced in sketching from nature by very many china painters, who have not gone through a regular course of water-colour painting, has been, that quite different sets of colours have had to be used for the sketch and for the work on the ware. This, of course, means that, except to those at once experienced in both lines, who have their mixtures "at their fingers' ends," there has been not a little loss of time—perhaps temper, too—and much consideration required to produce equivalent tints in the different makes. This need no longer be so. The moist enamel colours with water are intended to be used for sketching on paper, and *with the same colours* as used for the sketch, the finished painting may be produced on the ware.

(*e.*) In Part XV., I answered an inquiry relative to painting on terra cotta in such a way that the work need not be "fired." At the time that answer was written, information as to these paints could not be included in it. I may now, therefore, be permitted to state here (although the remark is, to a slight extent, foreign to my subject) that these paints may be used equally well on paper, silk, or terra cotta, and *without any preparation of the material*, the reverse side of which is not affected. With them, and the aid of a "mineral varnish" issued with them, a perfect semblance of an oil-painting or an under-glaze can be produced. This varnish is elastic to the highest degree, and does not crack, and its utility is at once apparent. Such a painting on china or terra cotta, properly varnished, does not require to be fired, and is very lasting.

These colours are in tubes, and are mostly supplied at 6d. half size, and 9d. whole size. The megilp is 3d. a tube.

SLAB AND MULLER.

43. *Preparation of Slab.*—For the mixing of the medium and colour, we shall require a glass slab and a glass muller. These will not injuriously affect any of the colours, which are already so fine that a rub or two is sufficient to reduce them with the medium to the requisite perfect cream. The slab should be of ground glass, as polished glass offers no "tooth" to bite the paint in grinding. The slabs usually procurable at shops are too rough, so that frequently minute particles of colour can lodge in the interstices, and be with difficulty displaced. Instead of buying these, it has been recommended to grind with water a little very fine sand on a piece of plain plate-glass, when

the polish will be removed and a sufficient tooth produced. I have found, however, that this trouble is saved by going to a glazier's, and there some ground glass quite fine enough may be seen, of which a square may be had cut. The glass should be at least $\frac{3}{16}$ inch thick, and be as free from colour as possible.

44. *Backing and Mounting Slab.*—Before using the slab, it will be well to fasten to the back (or plain side) of it a piece of perfectly white unsized paper, its own size, either with good white gum, or, better, "Stickphast" paste, and then glue on to the paper, when thoroughly dry, a piece of thick cloth. The paper shows up the colour in its true tint, and the cloth preserves the slab from breakage in the event of a fall on the floor. But, better still is the plan of making for the slab a wooden frame, having a slight rabbet like a picture frame. When the slab is in position the back is filled up with plaster of Paris made with water into a paste, and the whole should be backed with a piece of thin deal, which can be nailed to the frame with joiners' brads, which can be well driven home, so as not to scratch the table.

45. *Quantities.*—One slab and muller will be enough to start with. With work in colour two at least should be had for different classes of colour; and when gilding is undertaken, a separate slab and muller should be devoted to the metal, which would be spoiled by the slightest trace of colour.

As to *size*, a 6-inch square will be the most generally useful. An 8-inch one will meet all requirements, while for gold, a 4-inch one will be quite large enough.

Prices.—Slab only, 4-inch, 6d.; 6-inch, 9d. to 1s. 4d.; 8-inch, 1s. 6d. to 1s. 8d. Set in frame, 4-inch, 2s. 6d.; 6-inch, 3s.; 8-inch, 4s. 3d. The latter are Messrs. Lechertier, Barbe, and Co.'s prices.

46. *The Muller* is a knob of glass with a flat surface, with which to do the grinding. Three shapes are given in Fig. 22; of these forms A is the least good. *As to size*, for small quantities of paint a 1-inch diameter will be large enough, when, however, ground-laying or other operation, in which much colour will be used quickly, is in hand, it may often be advantageous to use a $1\frac{1}{2}$-inch size. *Prices.*—1-inch, 5d. to 9d.; $1\frac{1}{2}$-inch, 9d. to 1s.

47. *To Clean the Slab and Muller.*—First remove the colour with a piece of rag or soft paper, then rub them with a piece of rag soaked in common turpentine, and then scrub with a brush, such as a nail-brush, using soap and warm water.

In the next paper, the consideration of the requisites for overglaze painting will be concluded, and we shall commence actual work with elementary processes.

(*To be continued.*)

A MANTELPIECE WITH TILE PANELS.

(*For Illustrations not included in the text, see the Supplement to this Part.*)

By MICHAEL MICHAELOVITCH.

AS there are several readers of AMATEUR WORK who express a wish for a design for a mantelpiece with tile panels, such as an amateur can make for himself, I have attempted to meet their desire; whether I have been successful or not, I must leave it to others to judge. I may, however, say that a mantelpiece made according to the design given would not disgrace any dining or drawing-room. Of course, the mantelpiece, if wished, could be made alone, and I am sure it would look well; but as almost everyone wants an overmantel or mirror of some sort, at least, I have shown an overmantel which will go well with the mantelpiece, and one also—which is of the utmost importance—that can be very easily made.

I have put tiles in it as well, and on one side I have shown how a shelf could be introduced. I myself am always pleased to have an opportunity to display any little ornament above the fireplace, and this shelf is the very thing for it. Besides, all the best overmantels have two or more shelves in them. A bevelled mirror is decidedly the best to put into this overmantel; but if the expense is objected to (the bevelling alone costing, I believe, about a penny per inch lineal measurement), then put in a plain plate.

If there are any readers somewhat accustomed to cabinet work, they will find no difficulty in making it from the details given on the drawings; but for the benefit of those who have had little or no experience at this work, I may give some instructions as to the very easiest way to make this article. Skilled workmen may laugh at my simple method, if they like; but for this I care nothing—if my mantelpiece is of service to anyone, I have gained my end.

Well, to begin with, draw out your mantelpiece full size, either on paper or wood, and this will save a deal of thinking afterwards. Do not dispense with this essential preliminary, as you will work with greater ease with it before you, and the fear of making anything that will not fit afterwards need not disturb your mind, for you have the whole job arranged and thought out once for all.

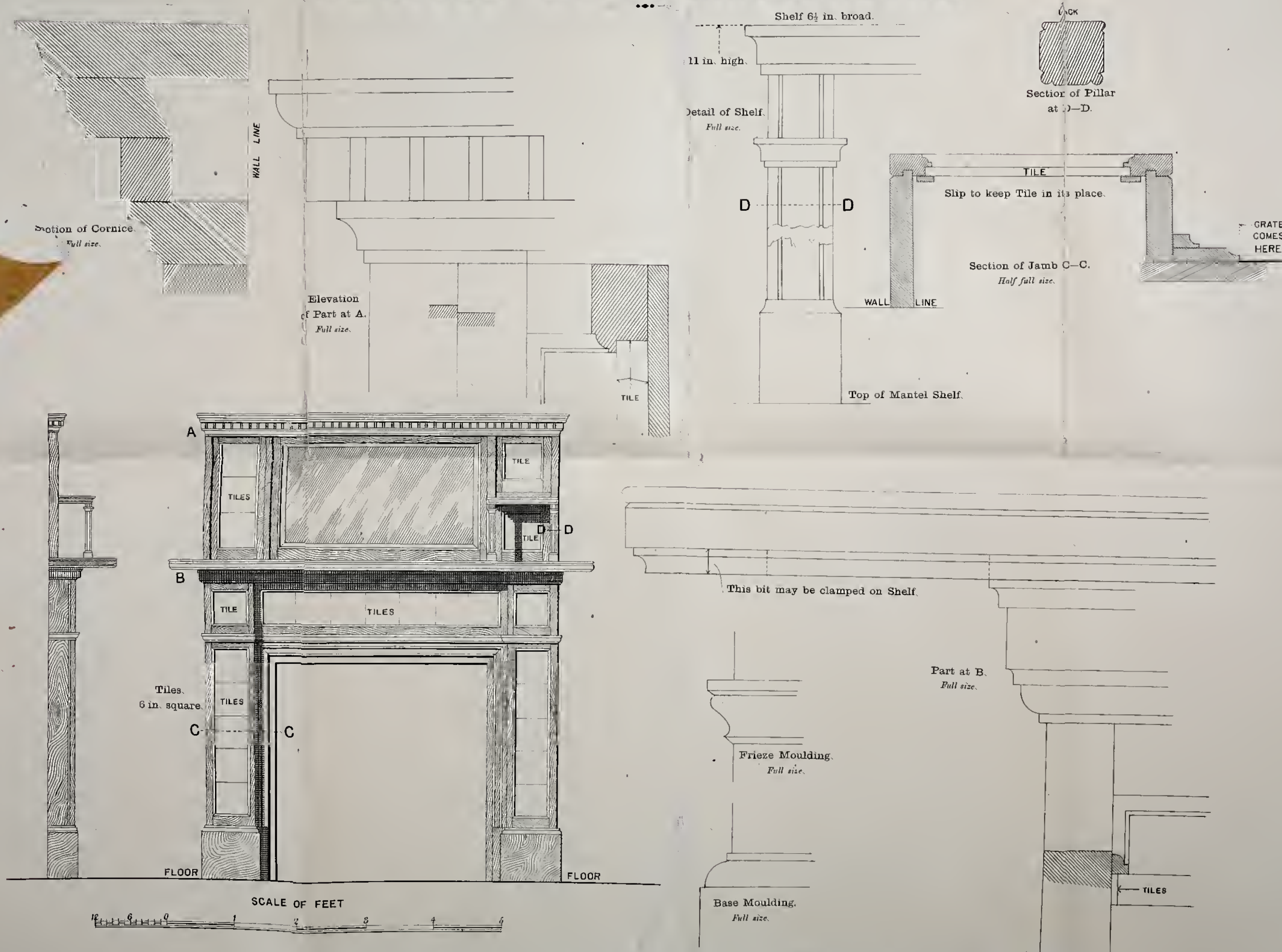
When this is thoroughly completed, get a board the full width of your jamb (9 inches) and $\frac{3}{4}$ in. thick. This is the ground of your jamb or pilaster. It should be of sufficient length to reach from floor to under edge of shelf. Then prepare your framing round the

Model Plates

XVI

PRESENTED WITH PART XVI. OF

AMATEUR WORK, ILLUSTRATED.



MANTEL-PIECE WITH TILE PANELS WITH DETAILS FULL SIZE.

...RD LOCK & CO. WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

tiles of 1$\frac{3}{8}$ in. by $\frac{7}{8}$ in. wood ; put a piece on each edge of your ground board with glue, the full length, then the cross-pieces at top and bottom, and underneath the top tile in the pilaster. In Fig. 1, which is a section across the jamb, A A are the pieces put on first. Fig. 2 is the appearance of the jamb or pilaster (both words mean the same thing at this stage). Notice the broad rail E ; it is 3$\frac{3}{8}$ in. broad, because when the neck moulding is planted round underneath the shelf, it will cover up 2 in. of this rail. Then the broad rail marked B is to form the margin round the tile at the top of the pilaster, and also the margin round the set of five tiles underneath it. It must be 3$\frac{3}{4}$ in. broad to give the two margins after, of course,

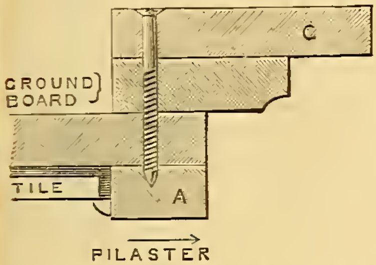


FIG. 3.—SECTION SHOWING CONNECTION OF MARGIN ROUND GRATE AND PILASTER.

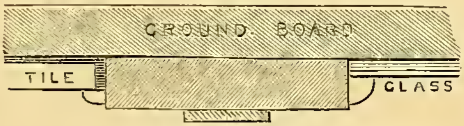


FIG. 4.—SECTION THROUGH DIVISION BETWEEN TILES AND MIRROR IN OVERMANTEL.

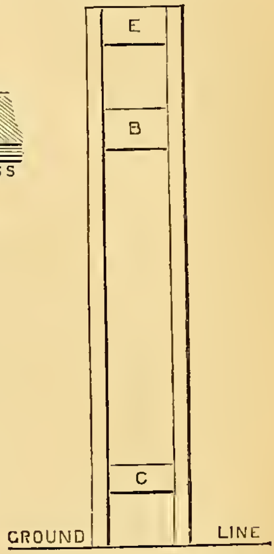


FIG. 2.—FRONT VIEW OF PILASTER BEFORE TILES ARE PUT ON.

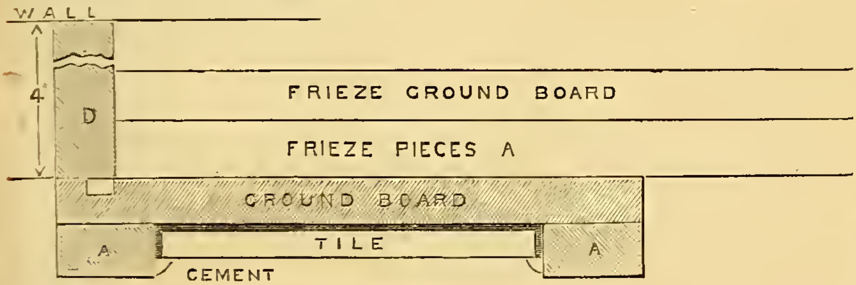


FIG. 1.—TRANSVERSE SECTION OF PILASTER.

allowing for the frieze moulding which will be put in the centre of this 3$\frac{3}{4}$ in. rail. Then the rail C forms the bottom margin, and extends about $\frac{1}{2}$ in. more than the portion of 1$\frac{3}{8}$ in. that is to be seen. The base will afterwards be brought up to leave the right margin. Now we are ready for the tiles. They are placed with a cement composed of glue and stucco, and should be very carefully put in so that the joinings of the pattern may meet exactly. When the tiles are properly set, a little quarter circle is put all round the tiles and sprigged in, and this makes a very nice and neat finish.

The frieze portion may now follow, after both jambs are made so far. It is, of course, constructed in exactly the same way as the pilaster, but the ground board and rails A must be made long enough to go behind the pilaster as far as the gable, *i.e.*, the piece going between the wall and the pilaster, see D, in Fig. 1. When the frieze is finished, it is screwed from behind into the ground board of the pilaster, this method of fixing making a strong job.

The gables must next be made and put on. Of course, they will extend from the ground to the under side of shelf, $\frac{7}{8}$ in. thick, and grooved and tongued with the ground board of the pilaster, and blocked to strengthen the joint. The neck moulding, *i.e.*, the moulding immediately underneath the shelf, may now be planted all round, of course returning round the pilaster, as shown on the drawing of the mantelpiece as finished. The frieze moulding goes on next in the same way. Then the margin of wood immediately round the grate must be put in (as in Fig. 3) behind the ground board of the pilaster. Of course, under the frieze it will be on the same face as the rails of the frieze ; indeed, the simpler way would be to make the under-rail A of the frieze and the margin stretching along the top of the grate between the pilasters, all of one piece of wood, which piece would measure 3$\frac{7}{8}$ in. wide, the upright margins round grate of course mitring into this. I have shown a piece of wood behind this again (marked G in Fig. 3) for the grate to back up against. It is not always put in, I know, but as, when the grate lies close to it, it decidedly helps to prevent a smoky chimney from annoying the inmates of the room, it ought always to be put in. The base can now be planted round the

foot of the pilaster, and butt up against the margin up to the grate on the one side, and the wall on the other side, of the pilaster. The mantelshelf now being prepared and put on, the mantelpiece is complete.

The overmantel is made in the same way as the pilasters of the mantelpiece. Get a board $\frac{3}{4}$ inch thick, and put crossends on it grooved and tongued. Their use is to prevent end-wood being seen. This board will be the full size of the overmantel, and have all the framing planted on it, the tiles and mirror being placed in as before (only there is no need for cementing the *mirror* in). The cornice is built upon the framing, and thin slips are planted on the framing running downwards from the cornice. These are to be $\frac{1}{4}$ in. thick and $1\frac{1}{4}$ in. wide, and are imitation posts in the overmantel. Fig. 4 shows a section through the wood between the tiles and the mirror. The rail is $3\frac{3}{4}$ in. broad and $\frac{7}{8}$ in. thick, and when the slip for the post is put on it leaves a margin of $1\frac{1}{4}$ inch broad round the tiles and the mirror. Of course, the margin at top and bottom must be the same, viz., $1\frac{1}{4}$ in.

Now, if it is decided to have a shelf, two pillars will be required to support it, or it could be supported on little brackets, if preferred. I myself would have pillars, but as all of us have ideas of our own on this and other points—and it would be a pity if we had not !—each must please himself. If a turned pillar could be made or got, it would be better than a square column, but I have seen this square column made, and it looked remarkably well, so no one need be afraid of its appearance being outrageously bad when made. It is easily made, being simply a square length with a bead run on each edge, a little cavetto planted round it near the top, and a square base made for it, and dowelled on. Then a dowel is put into each end of the pillar, and let into the little shelf and the mantelshelf. The little posts are checked to allow the shelf to go close to the framing, and then screwed from behind. The dentils in the cornice are a great enrichment to the whole, and are cut out of the member of the cornice before it is built together. If a lathe is at hand, it would not be much more trouble or expense to put a row of balusters along the top above the cornice. This would improve the design considerably, but I have left them out, to show that it would look well without them if the amateur had not the opportunity of getting them.

The wood to make this mantelpiece with must be left to the maker, but if cost is not a serious consideration, walnut or mahogany would be as good as any. The ground boards could be made of deal, but of course it would be necessary to take care that none of it was seen on the end of the job. But for an amateur, I would strongly recommend him to make it of yellow pine or any other wood of that description, and then stain it with, perhaps, Stephens's Wood Stains, which I think are the best in the market. They send samples of their different stains on a little slip of wood to any address, and their satinwood and mahogany are particularly nice.

Before bringing my remarks to a close, it may, perhaps, be as well to say a few words to amateurs who attempt for the first time the work I have described, or endeavoured to describe, without having had what I may term an *average* experience in joinery. When anything difficult or out of the way was to be attempted for the first time as a mere essay that might point the way to a discovery, especially in matters of chemistry or surgery, our ancestors were wont to advise, *Fiat experimentum in corpore vili.* The same may be said with equal justice to an amateur wood-worker who is attempting a piece of furniture or a mantelpiece without any previous experience, or, to put it in simple English—Let the first attempt be made in deal, which will not be regretted as much as a more expensive wood, if it end in failure.

I trust anyone who makes this article may experience as much pleasure as I have had in designing and writing about it, and hope that I have made everything connected with it quite plain and distinct to even the most inexperienced, so that a perfect success may be the result of the labour expended on it.

The illustrations in the Supplement will explain themselves. I have considered it necessary to refer only to the four illustrations that are given in the text, for the purpose of making my remarks, on the one hand, and the method of making to be followed, on the other, as clear and intelligible as possible to the reader. Referring once more to the Supplement, I have endeavoured to assist the amateur wood-worker who may like to try his hand on the mantelpiece, as much as possible by putting him in possession of full-sized drawings of the details.

NOTES ON NOVELTIES.

THOSE who prefer to have as much of the genuine article as possible in decorative work in their houses, in place of mere imitation by paint, can do so at comparatively little cost—certainly but little more than the cost of painting and varnishing—by providing themselves with some of the beautiful mosaic wood veneers for decorative purposes that may be seen at 72, *Finsbury Pavement, London, E.C.*, where they are exhibited and supplied in any quantity, large

or small, by Mr. M. Wilmersdorffer, the agent for the sale of the veneers in the United Kingdom. They are manufactured in Vienna, or near that city, and the work may be designated an Austrian industry of the first importance. An idea of the nature of this new production for the surface decoration of walls, doors, etc., may best be gathered from a rough description of the mode of making it. First of all, a number of pieces of wood of different shades and colours are put together so as to form a pattern in mosaic work. The various pieces are glued and clamped together, and when dry the whole conglomeration presents a solid mass, through which the pattern runs in unbroken uniformity from top to bottom. By this means, a log of wood, as we may call it, for convenience' sake, is formed, rectangular in shape, of such length, width, and thickness as may be most suitable for the purpose in view. When ready, this log is subjected to the action of powerful cutting machinery, by which shaving after shaving is taken off from the *entire surface* of the composite block of wood until the whole has been reduced to laminæ, or shavings of the utmost thinness. Each shaving is then backed with thin paper of great strength, and it is then in a condition to be used for surface decoration, in precisely the same manner as any ordinary wall-paper.

The effect, however, that is produced is immensely superior; for, instead of the production of the paper-makers' art, which at the best is never wholly satisfactory to the eye, we have a surface composed of natural wood, whose varied tints and markings are always pleasing, and which needs only a protecting coat of transparent varnish, which heightens the general effect and acts as a preservative, preventing the entrance of particles of dust into the pores of the wood, and rendering it fit to bear the ordinary cleansing processes which are so necessary in spring and autumn. Conceive the effect of a door, for example, in which the panels are filled with suitable mosaic work and the styles and rails covered with a veneer of wood that would form the most appropriate framing to the ornamental panels. The mouldings only need be in solid ornamental wood, but as it is not many feet that would be required for the panels of an ordinary door, the additional cost in this respect would be but trifling. And, again, for decorating home-made furniture nothing could be more useful to the amateur, for what could look better than strips of this ornamental wood mosaic work running along the facia of the cornice of a bookcase, extending along the side of a room and along the members of the plinth, and even on the edges of the uprights that carry the shelves, for this mosaic may be obtained in strips of various widths ranging from $\frac{3}{8}$ in. to $7\frac{1}{2}$ in., while greater widths may be covered by a judicious combination of strips. These veneers are applied to bookbinding as well as to surface decoration in houses. To judge of their beauty and adaptability for decorative purposes they must be seen, for my description fails entirely to convey anything approaching a suitable idea of its handsome appearance, utility, strength, and fitness for the purposes for which it is prepared.

Let me now say something about prices, repeating once more that the "Decorative Wood Veneers," which are included in the first section of this ornamental wood mosaic, can be used as a decoration on wood, such as furniture, deal doors, wood panelling, etc., or they can be fixed to walls, skirtings, ceilings, etc., giving the effect of solid panelling. Glue, or paste mixed with glue, should be used in fixing them, and when fixed and dry they may be polished or veneered, as preferred. And the price of fillings, that is to say, of patterns suitable for panelling, is only 3d., 4d., and 5d. per square foot; and of borders, 9d., 1s., 1s. 3d., and 1s. 6d. per yard run, according to width and design. The second section of this work comprises "Marqueterie and Mosaic Bands," suitable for the decoration of furniture, as being imitative of the finest inlaid work. A special feature is that these bands and borders are quite ready for use; they require no sand-papering, being perfectly smooth on the top side. As an example of the purposes to which these may be put, I may suggest that a deal table could be transformed into an attractive library table by putting a bordering of marqueterie round the edge and upper surface of the top, and filling the centre with leather or even American cloth. The Marqueterie and Mosaic Bands cost from 3d. to 3s. 6d. per length of 30 inches. A third section comprises Parquet Flooring, made in blocks of 1 in. in thickness. The price ranges from 9d. per square foot upwards. Book-covers range from 1d. to 7d. each, according to size. I may add that for purposes of instruction in technical schools, Albums of Veneers are supplied by Mr. Wilmersdorffer at 18s. 6d. in cardboard cover, and at 23s. in inlaid wood cover, in which specimens of forty different kinds of woods used in the industrial arts are given. Each kind of wood is represented by three veneers, cut in three different ways and mounted on cardboard, so that the effect of the wood when cut in each way can be seen at a glance. Practical teaching of this kind deserves every encouragement in a practical country like ours.

It is frequently the case that one thing offers itself most opportunely to be spoken of in conjunction with another, and having just mentioned the Decorative Wood Veneers, I can now give my readers the name of the best possible stuff for applying them to surfaces, whether of wood or plaster. And here I must thank the writer of the letter of which the following is an extract for suggesting to the "Gloy" Manufacturing Company, *St. Mary's Chambers, St. Mary Axe, E.C.*, that samples should be sent to me of their excellent specialities—"Gloy," a substitute for paste and gum, and "Octopus Glue," a substitute for the ordinary glue, size, etc.; and I thank him all the more heartily because, prior to the receipt of these preparations, I was in utter ignorance of their existence, whereas, having made practical trial of them, I should now be very sorry to be without either or both of them for the space even of twenty-four hours. He writes, and writes most truly:—"They seem to be the very things to suit those who, like myself, are fond of amateur work, as carpenters, bookbinders, etc. This induces me to suggest that it might be the means of making them known, both to the advantage of such persons and of the Company, if you were to send samples to the Editor of a publication called AMATEUR WORK. The Editor takes notice of all novelties thus sent to him, and makes them known through the monthly numbers of the publication."

Now I can only say that of all compositions I ever

handled for the purpose of sticking paper, leather, wood, etc., together, these are, without exception, the stickiest, the cleanest to handle, the sweetest, and the cheapest, that I have yet been privileged to meet with. We all know the disadvantages of flour paste—how it generates mildew and how sour it smells after it has been kept a few days, even when made with alum for the purpose of keeping it. With "Gloy" there are none of these disadvantages, for it never deteriorates or turns sour by keeping, and is as good when the bottom of the bottle is reached as it was when the cork was first withdrawn. Its moisture is comparatively slight, and soon evaporates, leaving the articles to which it has been applied firm and dry in a very short time. It may be had in bottles at 6d. and 1s., or in bulk in a pure state at 12s. per cwt. Pure "Gloy" may be reduced in strength for ordinary purposes by adding two parts of water to one of the composition, which reduces its price to 4s. per cwt. for papering and attaching decorative work to walls. In diluting the "Gloy," it should be put into a wooden or earthen vessel, and water added gradually, stirring the whole well all the time until the required consistency is obtained. Comparing common glue and Octopus Glue, the former requires heating to render it fit for use, and is easily affected by moisture; the latter, on the contrary, requires no heating, and is therefore always fit for use. It has no smell like ordinary glue, is never affected by moisture, and is possessed of such marvellous adhesive properties that it will even cement glass to glass or to wood, thus forming a cheap, clean, and efficient substitute for putty and cement when used for these purposes. It is sold, like "Gloy," in bottles at 6d. and 1s., or in bulk at 15s. per cwt. It is used for every purpose for which common glue is now used, and may be diluted to a sufficient extent to serve as size for walls and woodwork when desired. I recommend all amateur carpenters, decorators, and bookbinders to provide themselves with both of these desirable and useful preparations. If your oilman does not keep them, as he ought, give him the Company's address, or write yourself to the Company for a sample bottle of each.

Messrs. Kent & Co., 293, *Euston Road, N.W.*, have sent me their "Special Price List of Buhl and Fretwork Tools and Materials, Treadle Fret Machines, Amateurs' Turning Lathes, Benches, and other Amateurs' Tools, Tools for Wood-carving, etc." One excellent feature in this catalogue is the completeness with which it is illustrated, the amateur being able to gather from the illustration, in almost every instance, the precise shape and character of the tool that he is about to send for.

I am in receipt of two manufacturers' catalogues from the United States. One of these is the "Price List and Descriptive Catalogue of Barnes' Patent Foot-Power Machinery," from Messrs. W. F. and John Barnes, Sole Manufacturers, *Rockford, Illinois, U.S.A.* The specialty of this firm is the manufacture of foot-power machinery *without dead centres*, and this principle they apply to scroll saws, lathes, and various kinds of machinery used by amateurs. To many of their machines seats are attached, and the driving wheel is worked by pedals, one on either side of it, after the manner of a bicycle. The advantage of this arrangement over the ordinary treadle system is obvious, for the amateur when seated has the opportunity of throwing the weight of both legs on the machine as driving power instead of one; the oscillation of the body is prevented, which is unavoidable when standing in front of a machine and driving it by the treading action of one leg only, and the body thus remaining undisturbed, the arms are free to perform any kind of work that may be necessary, whether in scroll sawing or lathe cutting. Messrs Barnes and Co. call special attention to their Scroll Saw No. 7, at £5 (I am giving rough approximations to the American prices in dollars); then No. 4 Lathe, at £10; then No. 1 Amateur Saw, with boring attachment, at £2 10s.; and then No. 6 Amateur Saw, also with boring attachment, at the same money. I hope that by the time this notice is in the hands of the readers of AMATEUR WORK, some of these desirable machines will be on their way to this country.

It seems a pity that wind power, which costs nothing but the machinery necessary to bring it into play, is not taken advantage of more than it is in this country for grinding corn, pumping water, and other purposes of the kind. It is used very commonly in the United States, to judge from the prospectus before me of "Leffel's Improved Iron Wind Engine," manufactured by Messrs. E. C. Leffel and Co., *Springfield, Ohio, U.S.A.* It consists of a pyramidal skeleton tower or derrick, one side of which is barred like a ladder to give access to the top, on which is placed a wheel like a turbine waterwheel in shape, which is set in motion by the wind, and imparts motive power to machinery for pumping, grinding corn, etc., and, *pari passu*, for generating electricity for electric lighting. These wind engines range in size from 8 to 12 feet (the diameter of the wheel, I suppose), and in price from £15 upwards, according to size and the kind of mill that is supplied with them. I hope the hint conveyed here may not be lost on those who are thinking of electric lighting in isolated situations.

In the last Part of this Magazine, a correspondent signing himself "A POLICE CONSTABLE," who was inquiring for some preparation for waterproofing boots and shoes, was recommended to try "Millen's Snow and Wet Repeller and Sole Protector." This has brought me a box of the preparation from the manufacturer. I will take an early opportunity of experimenting on it and reporting the result. It is not a thing that can be tested promptly, like "Gloy" and Octopus Glue, as everyone will readily understand. In the meantime, I may say that a box of the composition, measuring $5\frac{3}{4}$ in. by $4\frac{1}{2}$ in. by 1 in., outside measurement, is sent by the proprietor, Mr. Humphrey Millen, *Fern Factory, Little Marlow, Bucks*, for 1s., post free; and that he states it to be not only useful for preserving both uppers and soles of boots and shoes from wet and wear, but that it keeps from rusting gun-barrels, tricycles, knives, horses' bits, garden tools, and all metals, when applied to the surface with a warm rag. In appearance and smell the "Repeller" is very much like a large cake of scented soap. For application to boots and shoes it should be melted by gentle heat in an earthen pipkin and applied with a brush until the leather, which should be dry and clean when the "Repeller" is put on, can absorb no more. When dressed, the uppers can be blacked and polished in the usual way.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

A Simple Incubator.

J. H. W. (*Galley Gate, York*) sends the following information, which is extracted from the *Country Gentleman*, and which is reproduced with the illustrations. J. H. W. writes in reference to it :—I forward you a

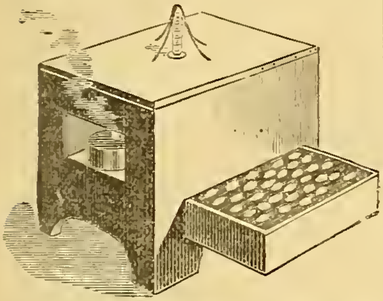


FIG. 1.—INCUBATOR, SHOWING DRAWER.

slip about an incubator, which an amateur can make for himself. I know it is a good one, for I have had one myself in use for seven years. "A correspondent of the *Country Gentleman* says:—' There having been many inquiries, within the last few years, for the most approved methods of hatching and rearing chickens without the assistance of the hen, I send the enclosed sketches of hatching-box and artificial mother in use in France, and invented by M. Carbonnier. The construction and operation of both are so simple that I believe almost anyone of ordinary ingenuity can make and use them successfully. Fig. 1 represents the incubator, with the drawer containing the eggs partly drawn out. Fig. 2 shows a section of the same. The upper part of the box contains a zinc reservoir, with a space left, as shown in the drawing, for the introduction of the lamp, and a small tube passing through the top of the box, which serves for filling it with water, and also for holding a thermometer, which, plunged

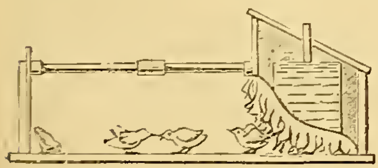


FIG. 3.--SECTION OF ARTIFICIAL MOTHER.

into the water below, indicates the temperature. Thermometer tubes may be obtained, and held in position continually by inserting through a perforated cork of the proper size; the temperature of the water may then be seen at a glance. The drawer for the eggs is immediately beneath the reservoir; it is provided with two small holes for ventilation, and holds about forty eggs. A space is left around the reservoir and on three sides of the drawer for filling with sawdust or other non-conducting material. A flat tin lamp, with two round wicks, is used by the inventor; but I see no reason why one properly-constructed kerosene burner would not answer the purpose. A little soft hay is spread in the bottom of the drawer, the eggs are then put in—it is then closed, and warmed by the water above. The temperature of the water is kept at 122°, or enough, higher or lower, to keep the eggs at 104° to 106°. Once or twice each day the drawer is opened, and the egg turned, and left for a quarter of an hour in the open air before replacing. At the end of twenty-one days the chickens come out of the shell without assistance, and are left twenty-four hours in the drawers, without food, before being taken to the artificial mother. This operation follows the natural method exactly. The eggs receive their heat from above; they are turned each day, and are ventilated, as in the case when under the mother. The holes for ventilation in the drawers are very small, and probably could be dispensed with without inconvenience, as few will make the drawer air-tight.

"'The artificial mother is also provided with a zinc reservoir, of the shape shown

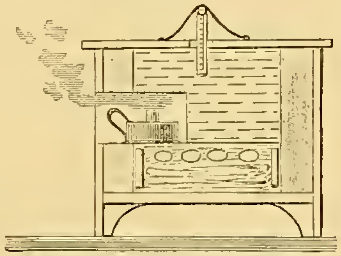


FIG. 2.—SECTION OF INCUBATOR.

in Fig. 3; it is covered below with a lamb's skin, in the warmed wool of which the chickens nestle and warm themselves. This reservoir is only filled in cold weather, and then only once a day, the water being first brought to a temperature of 160° to 175°. The tube passing up from this reservoir is used for filling, and one at the side for emptying. The top of the box is of glass, and arranged to slide, so as to open at pleasure; there are three ventilating holes on each side, and a gate at the end. The chickens are placed in this when twenty-four hours old, and kept there for a week; they are then gradually habituated to the outside air, the gate being constantly open for them to enter at will. Fresh water and food are given five times each day, it being considered essential to give only small rations, and to repeat them frequently. This method of hatching and rearing chickens, which follows nature so closely, is used to a considerable extent in France, and is evidently satisfactory.'"

Politzer writes:—An incubator of a simple character may be made without difficulty in the following manner, and the description, it is hoped, will be sufficiently clear to enable anyone interested in the matter to elaborate its details to suit his special requirements. The incubator, a section of which is shown in Fig. 1, is made of tin. A is a square tin box, open at the top. At one end of this is a round hole, into which a pipe, F, is soldered. This pipe serves as a chimney to carry off the products of combustion from the lamp, E, which is placed at the other end. Here is a door, D, the construction of which is shown more clearly in Fig. 2, for taking out the lamp to trim it. A hole, H, must be made at the bottom of the door to admit air to the flame, above is a square hole, K, fitted with a piece of glass, so that the state of the flame can be seen without opening the door. B represents a deep

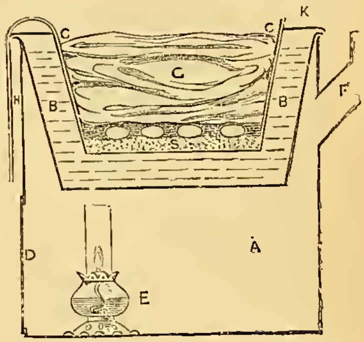


FIG. 1.—SECTION OF INCUBATOR.

hollow tray, partly filled with hot water; this tray rests on the edge of box A by a flange or rim at its upper edge. Inside this water-tray is placed a second one, C, in the bottom of which is placed an inch depth of white silver sand, S. Some recommend chaff instead of sand. On this the eggs are laid, and then over the top a number of folds of soft flannel or a folded blanket, G, laid lightly on, and not pressed down on the eggs. A common thermometer is to be laid on the sand, and the flame of the lamp so regulated that the heat should never rise above 104°, as a very few degrees higher will kill all the chicks in the eggs. Pipes are shown at K, K in Fig. 1, to provide for the necessary access of air to the eggs. At the end of a week the eggs should be examined. To do this cut an oval hole in a large piece of cardboard. If this card is placed on its edge, with a candle on one side, and you hold the egg to be examined to the other, you will readily see if the egg

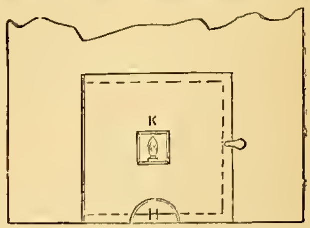


FIG. 2.—STRUCTURE OF DOOR.

is bad or good. If, after being in the incubator a week, the egg is clear and transparent, it may be discarded; but if it be dark and opaque, except a clear space at the large end, there is a growing chicken inside. The eggs should be turned over every day. This incubator will hatch fowls' eggs in about

three weeks; ducks' eggs take a few days longer. When the chickens are hatched they need an artificial mother (though some country people take the chicks away as fast as they are hatched, and put them in a basket of wool before the fire, and bring them up by hand). The chickens are placed in the artificial mother when twenty-four hours old, and kept there a week, when they may be gradually inured to the open air. The artificial mother is a tin vessel of hot water, standing on very short feet. The bottom of this vessel is covered with a piece of blanket or wool, and round the sides should be hung a kind of short curtain, with one opening through which the chickens can run in and out. The legs on one side should be a little taller than those on the other, so that there is a space for chickens of all sizes. The water should be kept at a temperature of 110°, by a thermometer. The great difficulty is to keep the artificial mother of a uniform heat. This can be accomplished by a small nightlight placed underneath at one end, and separated from the chicks by a small screen of tin. In using this artificial mother care should be taken to shift the place on which it stands every day, so as to enable the ground under it to be cleaned daily, the least accumulation of dirt being fatal. Ducks are more hardy than chickens, and can be reared by the aid of the artificial mother without any difficulty.

S. M. (*Altrincham*) is thanked for his letter, but he will see that the incubator he recommends has already been described by another contributor. He is also thanked for his commendation of Mr. Earnshaw's papers on "Boots and Shoes: How to Make Them and Repair Them," which will shortly be resumed.

Dead Finish for Black Walnut.

J. T. F. (*Brixton*).—The recipe for doing this, given on p. 283, Vol. I., will be more easily understood by you if you first read the article on "French Polishing" on page 248. There you will find that finely ground pumice stone can be purchased at oilshops, and that shellac finish is the ordinary French polish thinned down with spirit as used by French polishers in finishing their work. They also use a little linseed oil on the polishing pad, hence perhaps the term "oil finish." You must let one coat dry hard and free from dust before applying another, and not attempt to rub down until the whole is hard and firm. The "finish" will leave a gloss on the wood, but rubbing with linseed oil and powdered pumice will reduce this to a "dead" appearance. French polish is made of shellac dissolved in alcohol with a little colouring matter added.

Plants in Screens.

Billy Button.—I am under the impression that a reply has already been given to your question, either to yourself or some other applicant. The leaves, butterflies, etc., are to all appearance kept in place by the pressure of the sheets of glass on either side of them. Of course thick mid-ribs of fern leaves should be reduced. The use of any adhesive compound, except perhaps coaguline, would cause marks and smears on the glass.

Soap-Making.

Chester.—The articles on this subject were taken from the *Scientific American*. They did not prove as useful or as satisfactory as it was hoped they would be. The subject may be taken up and handled thoroughly by a competent English writer before long. Any question Chester likes to put on the subject, shall be answered, if it is possible to do so. If Chester has endeavoured to make any soap, will he furnish some notes of his experiences?

Silvering Mirrors.

W. G. G. (*Woodford*).—I do not supply you with the details of the silvering process, to which you allude, because it is a process too difficult for an amateur to carry out, and a mere summary of it would be next to useless. If you will take the trouble to look through "Amateurs in Council," you will find two or three addresses, at which silvered glass may be procured at very moderate prices, cut to any size required.

Electric Engines.

J. W. B. (*Lisson Grove*).—Articles on Electric Engines and Electric Motors will be given, I hope, in Vol. III.

Wood-lice in Wood.

L. R. (*Middleham*).—If it is a cold frame that is infested with wood-lice, give it a good scrubbing with soft soap and water as hot as can be handled, and then paint and stop all holes with putty.

Ferrules for Sticks.

E. U. (*Hawkhurst*).—Ferrules for walking-sticks may be obtained from any ironmonger or from any umbrella mender.

French-polishing.

Ebony.—1. It is not usual to French polish wood for fret-cutting before sawing. 2. The pattern should be pasted on the upper side of the wood to be cut. 3. In order to keep a glue-brush soft for use, wash it whenever you have done with it.

Plain Hand-Turning.

Foot-Lathe.—Attention shall be paid to your wishes in this respect; but I fear the subject must be deferred to Vol. III., owing to the great number now under treatment.

Booth's Mitre-Cutting Machines.

J. H. (*Brighton*) is assured that these machines are in every respect equal to what is said of them. A full description was given in Amateur Work, Part 12, November, 1882. Messrs. R. Melhuish and Sons, 83 and 85, *Fetter Lane, E.C.*, will supply you with any tools you require for clock-jobbing.

Bird-Stuffing.

A. A. S. (*Cambridge*).—This subject is one of the thousand and one matters that are suitable for treatment in the pages of this Magazine, and when a convenient opportunity offers, or a contributor who can write with authority on this subject turns up, it will be duly handled. There is a book, "Bird Preserving and Bird Mounting," by Richard Avis, which was published by Groombridge and Sons at 1s. It was one of the series of Shilling Practical Manuals published by this firm; but as I do not know it, I cannot bear testimony to its value or otherwise.

A Folding Book-Case.

*** In reference to the plan and method of making a folding book-case which appeared a short time since in Amateur Work, in "Wrinkles for Amateurs," and which was sent by a correspondent, A.W.K., of Bengal, Mr. Alexander Pilbeam wishes me to call attention to the fact that in May, 1863, he obtained a patent for improvements in the construction of Sewing Machines, one of the improvements being "the constructing of the table or support of a sewing machine with treadle driving gear, so as to fold down into the form of a compact case." The principle on which A. W. K.'s book-case is formed is identical with that on which Mr. Pilbeam's cases for sewing machines were constructed. I am sure, however, that A. W. K had not the slightest intention of appropriating Mr. Pilbeam's idea and working upon it in any way, but as Mr. Pilbeam was first in the field by nearly twenty years, it is clear that he is fully entitled to be considered the originator of the contrivance.

Fireplaces.

W. A. Jun. (*Portglenone*).—The subject shall receive attention. With regard to papyrotiles, see reply to F. W. O. (*East Dulwich*).

School for Amateur Mechanics.

Industria, who approves of Watchdog's suggestion in this matter, would be glad to lend a helping hand. Personally, if such a school for amateur mechanics could be set on foot, I think it would be most useful; but the difficulties and cost of starting it and carrying it out would be great and perhaps insuperable. We must wait a little longer for this.

Doll's House.

J. H. W. (*Liverpool*).—An article on this subject will appear in Amateur Work for April or May next.

Cleaning Old Prints.

J. H. (*Brighton*).—Mr. John Brion has undertaken to supply articles on Map-mounting, etc., and I daresay he will supplement these with instructions on cleaning and restoring old prints, engravings, drawings, etc.

Venetian Blinds.

W. C. (*Alfreton*).—I have your letter on this subject, but the slips containing queries on other matters which you mention are not with it. I cannot say when the promised articles on Venetian Blind-making will appear. It is not as easy as it may seem to meet with a man who can write well and intelligibly on a technical subject just when the article is wanted.

Ferneries.

A. B. (*West Bromwich*).—Instructions are now being given on the manufacture of ferneries of all kinds, and your special want shall not be forgotten.

S. H. B. (*Lincoln*).—See preceding reply. Your wants and wishes in other matters have been met.

Polishing Wood in Lathe.

E. G. H. (*Chatham*).—The only method of polishing, or, rather, imparting a smooth finish to wood in the lathe, is by simple friction.

Pianoforte Organs.

W. B. writes:—It may be useful to know that Bruthners, of Germany, and 7, *Wigmore Street, Cavendish Square, London*, are selling organs made in shape and form as a piano, no pipes being visible, but same consist of reeds fixed inside the case; being a *new invention* on the organ. Mr. Mark Wicks can, on application, obtain one of their explanatory catalogues, and perhaps will kindly enlighten amateurs thereon.

Mr. Hasluck's Articles.

T. B. T. (*Carnew, Co. Wicklow*), F. L. (*Northampton*), A SUBSCRIBER, and others, write to ask when Mr. Hasluck is going to complete his articles on "Lathe Making" and "Household Clocks." For reasons which it is unnecessary to enter into here, Mr. Hasluck has ceased to be a contributor to AMATEUR WORK, and, in consequence, will not finish the papers he undertook to write. I regret that any reader should have experienced temporary disappointment in the delay that has occurred, but I will take care that the disappointment shall be effaced as far as possible by the speedy appearance of some papers on "Lathe Construction" and "Clock Repairing," etc., that shall have the merit of being thoroughly practical and dealing efficiently and exhaustively with the subject in hand.

Concertina Tongues and Tuning.

J. H. W.—Concertina tongues may be got of S. Butler, 29, *Haymarket*, Thomas R. Willis, 29, *Minories, London*, or of almost all musical instrument dealers, at about 2s. a gross, assorted sizes.

CONSTANT READER.—Concertina reed tuning requires a few tools to begin with. A small table vice, pliers, small hammer, small fine file, small steel punch to punch out old rivets, a lifter, made of very thin steel and made thinner at one end, to put under the tongues when filing, and also for twanging the note to find its tone in relation to the others. The tongues or notes, when bought, are cut out of sheet brass, and all of one thickness. Along with the notes, one needs soft iron or copper wire for rivets. Fitting and tuning is a delicate job, and requires a good deal of patient practice before it is got into. The operation is as follows:—Select a tongue that will cover the aperture in the reed-plate. Place it in position, and pass a fine reamer through both holes, to get them both same size. Now fit the rivet by tapering the wire; pass it through both tongue and plate till tight; turn the plate over, and draw with a fine needle draw point all round in the aperture, thus marking the tongue the exact size. Remove the tongue, and file edges and end till it fits the aperture, but no more. Then make an inspection of the form of the other tongues as to thickness; for instance, you will find the lower notes to be thicker at the point than back towards the centre, while the high notes on the right hand are thinned out to the point. File the new note as near as may be like those on either side of it; then cut the rivet right length, and rivet, seeing at the same time that the tongue plays free in the aperture without touching in any part. This done, you have now got to tune it. Twang with the steel slip, and find its tone in relation to the other notes. You will probably find some other note that is the new one's octave, or in some cases the same note in unison; then the tuning should be an easy matter. Or begin twanging from C below the new note up an octave; you will soon find if your new note is not at the right pitch. In filing, place the steel slip between the note and the reed-plate. Filing at the point sharpens a note; filing towards the rivet lowers or flattens a note. In filing, care must be taken not to touch any of the other notes with the file, or they will be put out of tune. Sometimes the new brass is of a different temperament from the other notes. To harden it before fitting, hammer the tongue on a small smooth anvil, thinning out towards the point. In this way a tongue that is short for the aperture will be considerably longer when hammered.

Glaziers' Diamond.

A. B. (*East Grinstead*).—You can buy glaziers' diamonds at any ironmonger's. One man can use a diamond with good effect that another can do nothing with. It does not depend so much on the diamond itself as on acquiring the knack of using it, and from your saying that you can sometimes cut fairly well with it and at other times break a lot, I gather that you do not always hold it at the same angle. If it is permissible, in buying a diamond make trial of a few, and select that with which you can do best. With regard to the method of laying out a flower-bed in the form of a fleur-de-lis by rule and compasses, this shall be supplied in a future number. Designs for geometrical beds are given in price lists of plants very frequently. I saw some excellent ones not long ago in one of the Swanley Catalogues.

Frame-Gilding.

BETA DELTA.—It requires an article, perhaps a series of articles, to explain the processes involved in gilding frames for pictures and mirrors in a proper and intelligible manner. Speaking briefly, the wood is first coated with at least two layers of size and whiting. Several coats of gold size are then laid on, after which gold leaf is applied in strips of a suitable size.

G. W. H.—See preceding reply to BETA DELTA.

Show Cases for Counters.

R. P. C.—If you will bring your special want in this matter before me, I will endeavour to help you through this department of the Magazine; but the subject is not of sufficient general interest to be treated separately.

Soldering.

E. C.—Thanks for your letter; it has been forwarded to Mr. Edwinson, who expresses himself well pleased with it. Coming from such an authority as a "Foreman Tinplate Worker," it is most valuable. E.C. writes to correct some errors in the first article on Brazing and Soldering. He says: "1. In shop parlance 'killed spirits,' any clean water will do, about one-third the quantity of acid." Do you mean to say that "killed spirits" in shop parlance is composed of one part acid and two parts of any clean water, for this is what your statement means? If so I must beg to differ from you. "Killed spirits" is made as was described on page 40, and rain water is better than any other clean water to add to the acid. He next says, "2. No. 6 is the best form of soldering iron for most practical uses, No. 9 gets worn out too soon through the screw of the shank becoming loose. Your readers will do best to buy their copper bits, they can get useful ones for 1s. or 1s. 6d." Would it surprise you to know that I have an iron made similar to that sketched at Fig. 9, page 41, and that it has been in use for the last three years, but the screw is not loose yet. AMATEUR WORK has many thousands of readers, and many of them reside out of London, in places where a properly made copper bit cannot be procured for the modest sum named by you. Some of those readers have not the means to make the copper bits, Fig. 6, but could make No. 9. My critic next thinks that I want to scald or burn the eyes of my readers. I have no wish to do anything of the kind, nor to even induce them to undertake dangerous work. He then takes exception to bismuth solders, and says that an excellent alloy for solder is made of 14 parts tin to 10 of lead; melt the lead and then add the tin, together with "some fat," stir it about, skim off the dross, and pour the alloy into a mould of angle iron carefully dried. E.C. certainly states his case satisfactorily to himself, from his point of view, and doubtless that is quite correct for a tinplate worker, but he must allow that many men have many minds, and many different methods of arriving at the same result in practice. He may not need bismuth in his solder, whilst other persons may require a solder that will melt at a temperature below that at which his solder will melt. It may suit a tinplate worker to use a solder imperfectly mixed, but others may be glad to know that alloys mix best when they have been first melted and granulated, by pouring them from the ladle into a pail of water, then remelted. There is no danger about this operation, unless the operator is silly enough to put his head down close to the pail. A little tallow on the melted solder will certainly keep the tin from being oxydised, and an angle iron mould is preferable to those named in my article. Respecting his last dreadful threat, I do not feel in the least alarmed, and hope that he will carry it out by keeping a sharp look out for errors. It is more than possible he may find several in my second article, for although experienced in the use of blowpipe and soldering tools, I lack his experience in sheet metal work.

T. J. O. C.—I heartily thank you for your letter and strictures on the second article of "Brazing and Soldering." I agree with you when you say, "If those who work in sheet metal will provide themselves with a hatchet stake, a parallel stake, and a tapered stake and a tinman's mallet, they will never require to use pliers. True, but for those who cannot procure such tools, what in lieu of them? Bottoms ⅛ of an inch margin may be easily turned up without notch or wrinkle on a round stake by a skilled sheet metal worker.

Prizes in connection with "Amateur Work."

HEREWARD.—Your suggestion shall be kept in view, and in all probability will be acted on at some future time. It is, however, a matter that requires careful consideration.

Window-cleaning Chair.

G. W. B. (*Forest Gate*).—The two rough sketches I send are nearly self-explanatory, but I had better give the dimensions of the stuff used. The same letters are used for both drawings. The two bearers, C C,

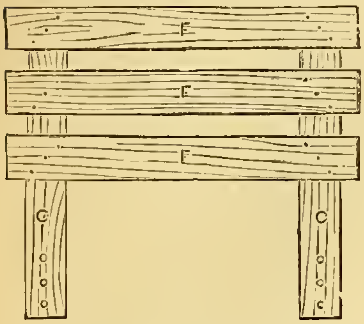


FIG. 1.—PLAN OF SEAT.

should be 6 inches by 2 inches, and about 4 feet long; the boards lettered F to be 7 inches by 1 inch, and 3 feet long. The struts and ties, D E, may be 2 inches by 1½ inches, and B, which connects the two struts, B, at each end, should be 3 inches by 2 inches, and 3 feet long. The irons marked H any smith will make; they should be ⅝ inch diameter. Of course two irons will be required, one in each bearer. The

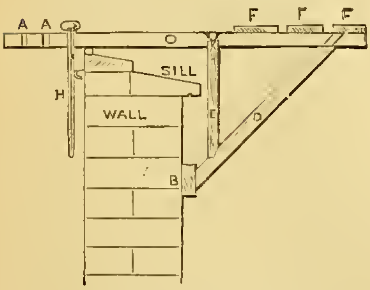


FIG. 2.—SECTION OF CHAIR.

chair can be notched and screwed together, or mortised and tenoned, as preferred. It gives plenty of standing room, and as much safety as an adult needs for the purpose. [From a PRO.]

Iron Mitre Box.

H. C. S. (*Throgmorton Street*).—A simple iron mitre box made after the manner of wooden mitre boxes would ruin your saw. If you are in the habit of doing pretty much in the way of mitring, get one of Booth's Machines, for Mitre Cutting, which have been described, and frequently mentioned in this Magazine. If, however, you have set your mind on having an iron mitre box, with which you can use a saw without hurting it, Messrs. Churchill & Co., or any ironmonger through this firm will supply you with the "Patent Improved Mitre Box," which can be used with a hand-saw, or tenon-saw. Its length is 20 inches, and its price, 28s.

"Amateur Work."

F. M. (*Wimborne*).—Your long letter in approval of AMATEUR WORK, is very encouraging, and shall be forwarded to the quarter indicated.

E. B. (*Cheltenham*).—We shall continue to deal with Lathe Work and Carving in Wood. The articles on "Boot and Shoe Making" will be continued. Many readers who are compelled by inexorable necessity to help themselves, like them, and take advantage of them. Tailoring is not a subject suitable for amateurs of the male kind: bootmaking is. You would be astonished to know how many amateurs take up organ-building.

Papyrotiles.

F. W. O. (*East Dulwich*.—For small quantities of papyrotiles apply at the *European Art Galleries, New Bond Street, W.C.* Mr. T. J. Gulliche is the manager. There should be no difficulty in obtaining them through any upholsterer. Indeed it is desirable that all upholsterers, especially in the country, should keep sample patterns and receive orders.

S. K. G.—Possibly the offices of the Papyrotile Company have been removed from 14, *Holborn Viaduct*. Inquiries shall be made, and if so, their present address shall be found and given. More patterns for brackets shall be given. We shall be glad to receive good designs for these useful articles from any of our readers. S. K. G. further writes: Should any of your readers require glazed, or other tiles of that description, I can confidently recommend Mr. Wollescroft, of 177, *Upper Thames Street*, who will be found very obliging, and capable of supplying everything likely to be wanted in that way.

Recipe in "Ways and Means."

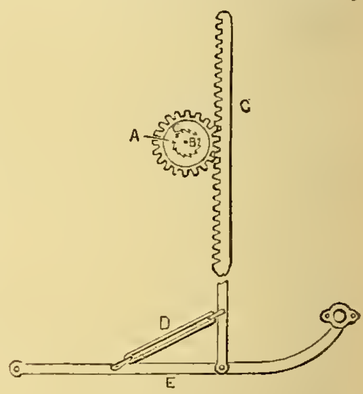
F. A. (*Cheetham*).—Please repeat your question. Private answers per envelope stamped and addressed, are not given. The recipes given in "Ways and Means" are not *warranted*. Read introductory matter at head of this department.

Paint for Tricycle.

H. M. A. (*Horsham*).—I may say that my experience in painting the tricycle is very limited. I use a varnish called Brunswick black. It gives a good skin for varnish, and dries in about an hour. Some tricycles are painted after the manner of the iron work of carriages, which is a very tedious process. Harrington's enamel is said to be the best coating for velocipedes. But I rather think the machines have to be sent to Harrington, *Much Park Street, Coventry*. Welch & Co., *Selborne Road, Denmark Hill, London, S.E.*, advertise enamels that may be used by the buyer, black, brown, blue, etc. To paint in the ordinary way, get white lead and boiled linseed oil, and add colour to tint as wanted; put in also driers. To make it dry quicker, put in ½ ounce sugar of lead and ½ ounce white vitriol. Rub down every coat of paint when dry with fine sand-paper. The result will be in proportion to the time spent in careful rubbing down and the number of coats given. Another method of varnishing is as follows:—Mix equal proportions of Canada balsam and spirit of turpentine, then add the colour very finely ground, give several coats and rub down with ground pumice stone. After the last coat draw the lines or other decorations, and apply when dry a coat of the same varnish without any colour.

Driving Tricycle.

W. D. Y. H.—Your idea of driving a tricycle by a ratchet wheel and rod looks feasible enough on paper. In its application several things would present themselves which you have probably failed to take into account. First of all, you aim at too much in proposing to get a revolution of driving wheels for each stroke of your pedals, unless the driving wheels were under 30 inches in diameter. The ratchet wheel in such a case would be under 4 inches in diameter, which would only be equal to a crank under 2 inch stroke. The toothed rod would not take the wheel unless its teeth were a little longer in pitch than those of the wheel,



SKETCH OF DRIVING GEAR FOR TRICYCLE.

as the faces of the latter have a radius from the centre, whereas those on the rod would be parallel on their gripping faces. The rods would have to be held to their work by rubber straps or by some other means, and the up stroke would produce an unpleasant whir. The idea is not quite new, though your proposed method of applying it may be. I enclose a sketch taken from a drawing of my own of a proposed driving gear which as yet remains on paper for the reason that a smooth pulley and strap effect exactly the same thing as the rod, and is much neater. A is an ordinary 6 inch cog-wheel with a long boss, it moves freely either way on the axle, along side it, but keyed to the shaft, is a wheel B, with slanting tooth, a steel hook on A engages the tooth of B. The rod C has teeth same as cog-wheel. It is held to its work by a rubber strap D, attached to it and the pedal lever E. This contrivance would do the work with little or no noise, as the hook would have a bit of leather on it. The upright rod is unsightly. There is considerable friction, and altogether a strap or chain round a smooth wheel, in lieu of the cog, is in every way to be preferred.

Filters.

Mr. A. W. Soward, the author of the papers on "Filters," writes—"I should esteem it a favour if you would kindly find a corner for the enclosed correction in the next issue of Amateur Work. I have received a note from Mr. Maignen upon the subject, and have promised him to ask you to put the matter right at the earliest opportunity."

Erratum.—In Mr. Alfred W. Soward's article on "Filters," in our last issue, the name of Mr. John Bell was given as the manufacturer of Maignen's patent "filtre-rapide." This is an error. The filters are made and sold by the inventor, Mr. P. A. Maignen, at 22 and 23, *Great Tower Street, E.C.* Mr. John Bell makes the asbestos cloth, and also has a wholesale depot of the filters.

Canoe-building.

T. S. E. (*Hampstead*).—I am glad you find the directions satisfactory. I never decked a canoe with wood, but I believe the usual way to join the edges is as in a door, with the help of a rabbeting plane. Rivet-plates may look better than clinched rails, but this is about their only merit, and they are, I believe, expensive. A standing lug does well, if small; but I found it quite unmanageable when of large size. A jib-shaped spanker has *nothing* in its favour, being quite as hard, or easy, to manage, as the style recommended in Amateur Work, and less than half as powerful. Your idea of retaining the two small sections, and so forming two water-tight compartments, seems a very good one, as also your suggestion of steering with the feet, or at least making provision for doing so on emergencies.

INFORMATION SOUGHT.

Brass Chessmen.

K. W. (*Stockton-on-Tees*) writes:—I should be much obliged if you, or any of your readers, through the medium of your Magazine, would kindly inform me where it is possible to obtain a set of chessmen, cast in brass, or bronze metal? I believe they are only made in Berlin, but I cannot ascertain the address of the firm producing them.

Polish Used by Chairmakers.

A Young Amateur writes:—Will you kindly inform me how the varnish, or polish, used by the "Wycombe" chair-makers is made and applied? If it can be obtained ready mixed, please let me know where I shall be most likely to get it.

Electric Clock.

T. O'C. (*Dundalk*) asks (1) for the necessary instructions for putting up an electric clock, according to the latest improvements; and (2) if it is possible to purchase a stove, heated by petroleum, that would heat a soldering iron.

Induction Coil.

G. A. M. B. (*Langham*) wishes very much to know how to make an induction coil, not very large, for experiments, with full instructions, and also illustrations; and also, how to make the battery that is to be used with it, and in what proportions to mix the acid and the water.

Fret Machines.

W. C. (*Alfreton*) writes:—I am wanting to buy for one of my boys a cheap machine as a beginning. Will some of my brother amateurs kindly say which one they can recommend? I would make one after the pattern that appeared in No. 1, page 36, but it is too cumbersome, and would not be suitable for a lad of twelve years of age, and I do not want to get one of the more expensive ones I see advertised. Has any one had experience of the "Prize Holly," by Harger Bros.?

Nitrate of Silver Stains, Etc.

F. A. E. (*Newtownbutler*) asks:—1. Can nitrate of silver stains be taken out of linen? If so, what would do it? 2. Would common iron wire do for the line wire of the telephone, if it was insulated, when it is to be fastened to the walls?

Table for Circular Saw.

J. R. K. (*Islandmore, Croom*) writes:—I want some one of your correspondents to give me a plan of a simple table for circular saw to go on the lathe bed, with description. I have the saw, a 6 in. one; but I want to make a table for it myself, of wood, if possible.

Gilding and Cutting Picture Mounts.

Rishton asks for information for gilding the edges of picture mounts, and what kinds of tools are used in cutting them.

Small Clocks.

J. H. (*Brighton*) asks:—Where can I get wholesale the small clocks that are now sold at from 3s. to 5s. each? I should like to know where I could obtain the skeleton parts to make one of them, with the names of parts of workings. [If our correspondent means the little American Drum Clocks that have been recently introduced, I do not think that it is possible for him to get the parts of one of them. The mechanism of them is delicate, and they will not stand much tampering with.—Ed.]

Dead Polish for Walnut Wood.

Ebony wishes for the necessary directions for imparting this kind of polish to walnut wood and ebony.

Cam Wood.

L. P. M. (*Stoke Newington*) wishes to know where he can procure some cam wood for ornamental turning.

Cement for Shells.

H. D. E., wishes to know of a cement to firmly join shells as ornaments.

Ramrod fixed in Gun Barrel.

W. H. C. (*Wrotham*) writes:—I have, owing to an accident, got a ramrod firmly fastened in a barrel of a gun with a piece of linen, would some of your correspondents oblige me with hints how to get it out without injuring the barrel. It is a muzzle-loading gun.

Paper Wheels and Pipes.

J. E. (*Farnworth*) asks for the addresses of manufacturers of compressed paper, suitable for small wheels, pipes, racks, etc.

Preparing Rabbit and Other Skins.

A. T. (*Lewisham Park*) writes:—What is the best and cheapest means to prepare rabbit and other skins for fur, and also for leather, so as to make them perfectly soft and pliable.

Making Spectroscope.

V. (*Ambleside*) writes:—Kindly state in Amateur Work if a rain-band spectroscope can be manufactured by an intelligent and skilful amateur mechanic, if so, I should be pleased to see a paper on the subject. Permit me to state that I was successful in making two pairs of telephones, according to the directions given by Mr. G. H. Sayer.

Cutting Mounts.

G. W. H. (*Bloomsbury*) wishes for instructions on this subject.

INFORMATION SUPPLIED.

*** It is difficult, even with the additional two pages that have now been given for the last four months, to keep pace with the applications that demand notice in "Amateurs in Council"; and in order to lighten the Editorial labour involved in adapting correspondence for the press, I must ask all who contribute to this department of the magazine, by affording information that is asked for in the department headed "Information Sought," to adopt the following rules:—

1. Dispense entirely with the forms of commencing and ending a letter usually adopted, writing at the top of the paper, "Editor, Amateur Work," and no more.

2. Then write in full the head-line that appears above the paragraph in "Information Sought," to which the reply is given.

3. Next, commence a reply thus:—

A. B. C. (*Hounslow*), or Verax, etc. [that is, initials of real name and place of residence, or nom-de-plume of writer of reply, as preferred] sends the following reply to R. Q. Z. (*Aldershot*) or Hausfaoer [initials and place of residence, or nom-de-plume of applicant, as the case may be].

4. Lastly, let this commencement be followed by the reply.

Several valuable replies to queries have been unavoidably delayed, owing to the necessity of searching columns of "Amateurs in Council" in preceding parts of Amateur Work, in order to find out the head-line under which the reply should be placed, and the applicant to whom the reply is given. In future, no notice can be taken of "Information Supplied" by any correspondent who neglects the rules laid down as above.

Books on Organ Building.

Juvenis writes:—Let me recommend "Organ Voicing and Tuning for Amateurs," price 1s. 6d., published by Brabner, of *Kingsland Road*. With this useful little work, and the papers we have had, I think no amateur can complain of a lack of print on the subject, except, perhaps, on (a very important one to would-be organists) "Specifications," any suggestions for which I shall be happy to give.

Polishing Shells.

E. A. F. (*Cromer*) writes:—In reply to H. D. E., as to the best acid for polishing shells, the following is from "Spon's Workshop Receipts:" "Marine shells are cleaned by rubbing with a rag dipped in common hydrochloric acid till the outer dull skin is removed, washing in warm water, drying

in hot sawdust, and polishing with dry chamois leather." Care should be taken to keep the acid off the hands.

Waterproofing Boots.

I. H. M. (*Dublin*) writes in reply to Police-Constable:—Indiarubber is soluble in ether. To make boots waterproof, take of suet, 8 ozs.; linseed oil, 8 ozs.; yellow beeswax, 6 ozs.; neatsfoot oil, 1½ ozs.; lampblack, 1 oz.; litharge, ½ oz.; melt together, and stir till cold. [Letters for Amateur Work should be addressed to the Editor.—Ed.]

Cutting Chimney of Lamp.

G. C. (*Manchester*) writes in answer to L. B.—It is possible to break the glass lamp chimney in this way. Make a small notch by means of a file on the glass, then make the end of a tobacco pipe or a rod of iron of the same size red hot in the fire, apply the hot iron to the notch, and draw it slowly along the surface of the glass in any direction you please; a crack will follow the direction of the iron. You can break glass to any required figure in this way.

J. T. F. (*Brixton*) writes in answer to L. B.—I managed to get off about 3 inches of the top of one I had in the following manner. The chimney was first packed moderately tight with old linen rags or soft cloth, this is merely to equalize the pressure made while cutting; now lay your stuffed tube on any soft bed, such as a folded tea cloth. I used one of the American glass cutters at 1s., holding it in a similar way to a pen, working it gently to and fro with just sufficient pressure that it "bites" into the glass, moisten the cutting wheel with a drop of spirits of wine now and then; when I had completed the circle round the tube, it was examined and any place found not sufficiently cut had another touch from the cutter. The packing was then withdrawn down as far as the cutting, holding the tube in the left hand, a tap from the handle of a knife completed the operation, and away went the top of the tube. I may add the first declined to be topped, but with care it can be done. The chimneys I operated on were of the commonest description. I should suggest sawdust as being better for packing than the cloths.

Cutting off Bottom of Glass Bottles.

J. T. F. (*Brixton*) writes:—A book in my possession gives the subjoined method to cut the lower part off a glass bottle: fix a thin line or cord (whipcord, or what is known as builders' line cord would perhaps answer the purpose), about 3 or 4 feet long to a hook in the wall, stand a pail of cold water close by, take the end of the line in your left hand, securely held, and twist it once round the bottle held by the neck in your right hand; now work the bottle to and fro rapidly as possible, letting the line slacken only enough to cause the bottle to slide backwards and forwards, the object being to generate a high degree of heat by friction of the cord round the glass, which after a few seconds is quickly plunged into the water, the shock of which it is said will cause the bottom to fly off. In your particular case I should say grasp the bottle by its middle instead of the neck, and see answer to L. B.

Truing Grindstone.

A French Subscriber writes in reply to Delta:—Every grindstone wants to be trued from time to time. The usual plan adopted by professional workmen is the following: Take a piece of sheet-iron, and secure it firmly upon the trough (by hand, or otherwise), close the grindstone. Let this one run gently towards the iron, which, of course, must be pushed on as it wears off. You will soon obtain, in more or less time, according to the state of the stone, a perfect true, and level surface. If your grindstone is much out of true, you had better begin to bite the humps, by hollowing grooves with the sharp end of an old saw-file, secured as above.

To Frost Silver.

C. M. H. (*Stoneley*) writes in answer to H. L. (*Hull*).—The surface of the article to be frosted must be first burned with a gas or other flame and blowpipe for about a minute. Then pour a small quantity of sulphuric acid into some warm water sufficient to give it a strong acid taste. Dip the article to be frosted into it for a minute or two, and if that has not the desired effect, boil it, then wash it with soap and water. If it is desired to burnish portions of it, do it before washing with soap and water as the silver is then soft. All iron, such as the pins of brooches, must be removed before the silver is put into the acid. I do not know if this will answer for gold or plated silver.

Bird Organ.

T. D. (*Bridlington Quay*) is informed that if he will drop a line to Mr. Grattan Brady, 46, *Lower George Street, Kingstown, Dublin*, who has a new eight-tune bird organ, of no service to him, to dispose of very reasonably, he may be well suited.

To Bend Bamboo.

J. T. F. (*Brixton*) writes:—I am afraid Carlo will have a difficulty here unless he can bring a powerful jet of steam to bear on his bamboo, which is the process adapted in making bent wood furniture.

Guide for Circular Saw.

J. T. F. (*Brixton*) writes in reply to A. B. (*Galston*).—Apply for guide for circular saw to Churchill Bros., *Finsbury*, and try Britannia Company, *Colchester*.

Incubators.

J. T. F. (*Brixton*) writes:—W. M. (*Egremont*) should write to Mr. J. Currel Denley, *Silsoe, Ampthill*, enclosing 1s. in stamps for his book how to build the above.

Metal Tubes for Colours.

A Correspondent who gives no name or nom-de-plume, writes:—Collapsible metal tubes, such as are required by F. V. R. (*Witham*), may be procured from Messrs. Saunders & Son, *Victoria Gardens, Ladbrooke Road, Notting Hill*.

Another Correspondent, who also gives neither name nor non-de-plume, writes in reply to F. V. R. (*Witham*), that metal tubes for colours may be obtained from Messrs. Brooks & Co., *Cumberland Market, Regent's Park, N.W.*

Graham writes:—Buy one. Strip off the paper and you will see the maker's name on it at bottom, or perhaps on the screw top.

Fittings for Cabinet Work.

Graham writes:—Any cabinet maker's ironmonger. William Tonks & Sons, *Moseley Street, Birmingham*, I have found simply perfect to deal with; also Messrs. Charles Churchill & Co.

Glass Engraver's Lathe.

Graham writes:—I saw a secondhand one at 63, *Upper Stephen Street, Dublin*, the other day. Holtzappfel keeps them in stock; also Caplutzi, *Chenies Street, Tottenham Court Road*.

Gilt Mouldings.

L. M. (*Bexley*) writes:—It may be useful to some of your readers to know that gilt mouldings can be bought of Mr. Rochefort, 62, *Houndsditch*, cheaper, I believe, than at any other house in London.

Sale of Fret-Sawing.

Industria writes:—In answer to E. M.'s query, I should advise him to take his work to a fancy picture-frame maker. I have sold many pounds' worth in this manner during the last four years.

Browning Gun-Barrels.

W. G. writes:—In answer to Gun-Barrel, a very good way to brown barrels of guns, is to apply a warm mixture of chloride of antimony (bronzing salts). The paste must be left on for some time. Afterwards, polish carefully.

J. H. M. (*Dublin*) writes:—In reply to information wanted, for receipt for browning guns, I send, sulphate of copper, 1 oz.; sweet spirits of nitre, 1 oz.; water, 1 pt.; let it stand for a few days and it will be fit for use.

Cutting Mouldings.

Lux Benigna in reply to E. W. (*Headley*) writes:—I expect E. W. means returning mouldings across the end-grain of a board; the ordinary moulding planes will work on the end-grain if helped out with a saw-cut to prevent their breaking away the plank face. A bead can be worked with a saw-cut, and finished with a file and glass-paper. In cabinet-work, where outward mouldings constantly occur, the file, saw, chisel, and gouge, are in constant requisition.

Use of Sewing-Machine Stand.

J. T. F. (*Brixton*) writes:—You could make use of the above for a lathe, but only a very small one, say 2 or 2½ inch centre, and I should say the best plan would be to buy one second-hand, which you can at once place on the stand, fit a band, and it is complete. You would have more satisfaction than attempting to fit it by casting, involving considerable labour in finishing up, truing, etc., and then probably the result would be, your treadle power would be deficient. The Britannia Company, *Colchester*, have just brought out a lathe which exactly meets your requirements, and you could have it minus the stand. I will tell you how to make your emery wheels for grinding and polishing, but you cannot hope to cut one-inch boards by it, for the reason that your driving-wheel is not heavy enough, the utmost you could expect would be half-an-inch, and that will take a lot of driving through hard woods.

RELIEVO MAPS AND THEIR CONSTRUCTION.

By JOHN BRION,
Constructor of Relievo Maps to H.R.H. the late Prince Consort.

III.—FINISHING—PREPARING THE MOULD, ETC.

ALL is now in readiness for finishing. The touches in modelling are so infinitely varied, and, as in drawing, depend so much on the taste and judgment, that it is impossible to do more than give very general directions. Our first advice is: strive to be natural, accustom yourself to look upon nature as the best tutor, and imitate her features as nearly as possible. The most gifted artist can only approach her very humbly, but he who seeks her frequent guidance can never entirely fail.

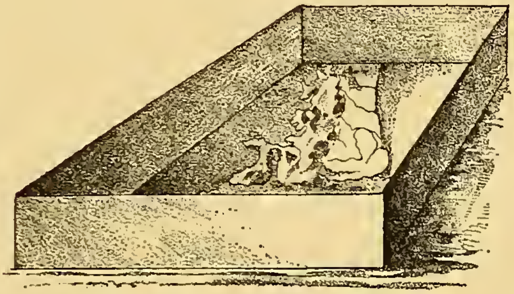


FIG. 15.—CASTING FRAME.

The sketch shown in Fig. 14, from a finished model, constructed on the spot, will give some indication regarding the appearance which a work ought to present when it leaves the modeller's hands for casting.

The rockwork of the undercliff and fissures in the cliffs above it are worked in with the modelling points given in our illustration in page 210; the smooth undulations of the downs are done with the flats and scrapers, finished off by careful touches with soft and damp hog-hair pencils.

formed of metal, cast, electrotyped, or engraved. I have had excellent specimens of metal castings done but let it be clearly understood, that if you decide on using such, the map which is to be embossed must be drawn to fit them *after* the cast is obtained; the contraction which the molten metal undergoes in cooling is so great that in a map of only six inches square everything would be thrown out of register. Electrotyped dies are entirely free from this objection, and are to be preferred to all others in every respect save cost. I will give directions for obtaining both, and then pass to a third species, which has all the merits of the electrotype at a hundredth part of the expense.

In order to prepare the model for casting, dissolve white wax, or beeswax, in turpentine, or other spirit, in such proportions as to produce a thick creamy consistence. Warm the bottle containing this, and also the model, very slightly before a gentle fire. With a soft hog-hair pencil brush over every portion of the model. The clay will absorb much of the wax. Let it stand a few minutes to cool. Warm the wax and model again and brush all over a second time, carrying the dissolved wax over the whole of the surface of the map, even where it has not been modelled up, namely, the sea, bays, etc. Be very careful not to miss a single point. Let the model cool again, then examine whether the wax has stopped any of the fine cuttings in the work; if so, pass it to and fro at a


FIG. 14.—ST. CATHERINE'S HILL AND UNDERCLIFF, ISLE OF WIGHT, FROM A RELIEVO MAP OF THE ISLAND.

Of one thing be specially assured in the final examination of your work, namely, that there is no undercutting, or miniature caverns, produced by too great roughness of work or porosity of the modelling clay. If such be found, remedy them, or you will risk the ruin of your model in casting. Taking the model to be satisfactorily completed, we now reach the all-important stage of obtaining a die or matrix for the purpose of embossing.

Dies for embossing paper work are generally

little distance from the fire till the superfluous wax is absorbed. Let all remain to cool, and while this is going on prepare for casting by taking four pieces of narrow thin wood of lengths to form a raised frame around the model. Tack the slips to the edges of the modelling board, so as to enclose the model in a kind of shallow box (Fig. 12). Be specially careful that this is of sufficient height to admit of plaster of Paris being cast to a depth of three inches for a model of eighteen inches square, adding half an inch in depth of plaster

for every six inches additional in length or breadth of modelled work. The slips of wood being securely tacked on (take care not to drive them home, as it will be necessary to draw them after the casting is finished), stop the corners with modelling clay to prevent leakage, brush the wood and every portion of the model carefully over with olive oil, and to make all secure it is well to repeat this operation two or three times. We are now ready for casting.

Be prepared with a proper supply of plaster of Paris, of *fine* quality, newly burned, price about four shillings per hundredweight. This may be obtained of any plaster figure-caster, and also at most of the lime and cement warehouses. It is well not to rely on that sold at oil and colour shops, as frequently it has been long in stock, and is consequently useless. In a large basin, or other convenient vessel, put lukewarm water, that has been previously boiled, to this add the dry plaster, scattering it gently on the surface with one hand, and briskly mixing it with the other, till the mass becomes of the consistence of thick cream. Shut all doors and windows to prevent draughts, and pour the liquid plaster steadily and continuously over the oiled surface of the model, shaking it gently for the first minute, in order that the plaster may enter the minutest parts of the work. It is well not to mix more plaster at first than will cover a depth of about one and a-half inches. Allow ten minutes to elapse, when a second quantity of plaster can be mixed, and the mould filled in to the required depth. *Coarse* plaster, which is about half the price of the fine, may be used for this. When it is completely set scrape the back to a perfect level. A piece of steel twelve inches long, or an ordinary table-knife, or a straight edged ruler, will effect this. I have found that lukewarm water that has been previously boiled preferable to cold water in mixing the plaster, as air bubbles, which so often deface a casting, are rarely seen when the former is used.

Note.—If the modeller has not been accustomed to use plaster of Paris, it will be well for him to practise a little by taking casts of any fitting objects about him, the inside or outside of a cut glass or porcelain dish, for example. A little use will give dexterity in the use of this beautiful material, and it is far better to expend a little plaster in practising, than to run the risk of spoiling a model by a first essay.

In about a quarter of an hour remove the wooden slips from the side of the model, and let it remain for an hour longer, taking care, meantime, to free the sides from any plaster that may have run between the side slips and the model. Before the expiration of an hour, the model and casting will begin to separate at the edges, but do not be hasty in attempting to lift your work. When about to do so, it is well to turn the cast over on its back, so as to bring the model upwards. Get someone to aid you in doing this, as care is required to prevent the cast from being broken by slips or jerks. If the modelling, waxing, and oiling have been properly done, the mould may now be lifted from the cast without difficulty or fracture; but if there be signs of adhesion between the two, let them remain longer than the hour prescribed. So much depends on the state of the atmosphere, and the quality of the plaster employed, that I have sometimes found a casting more ready for lifting in half an hour than at other times in thrice the space. Watchfulness and practice will soon enable the constructor to ascertain the proper period.

If it should be found that some portions of the model have adhered to the cast, do not hasten to detach them. If the waxing has been thorough they will soon detach themselves so far that they may be removed intact by one of your modelling tools, and affixed in their proper places to the model. Strong size or thin glue can be used as a cement. It is desirable that the model should be preserved as perfect as possible for future purposes.

The plaster die being thus separated, let it remain on edge, or horizontally supported by narrow pieces of wood, so as to allow the air to circulate beneath it, for twenty-four hours. It should then be closely examined in order to ascertain whether air bubbles appear in any part; if you discover any, stop them in thus: Mix a little fine plaster in a cup or saucer as for casting, scratch the bubble hole deep with a modelling point, wet it with cold water applied with a camel or hog-hair pencil, and, with the same, paint in the defect with the liquid plaster. By a few careful touches the finest modelling can thus be worked in.

The die, being of considerable thickness, will require several days to become thoroughly dry, unless, in warm summer weather it be exposed to the sun and air. If it be necessary to hasten the drying take care not to bring it too close to a fire, or the plaster will dry soft and floury, and thus be useless. Drying at a moderate distance from the fire is not objectionable, indeed, the sooner the cast is dried the better, for if it remains long wet it will become rotten. Do not be mistaken in supposing that the cast is dry when the surface appears to be so, one is ofttimes deceived thus, a clear ring from the cast when smartly struck by the knuckle is the best indication of thorough dryness.

With the die examined and approved, we have to determine whether we will employ a cast metal, electrotype, or the cheap perfect substitute already referred to, as a matrix for embossing.

If you wish for a cast metal matrix, you have simply to take your plaster die to a good founder, and in due course he will return it to you with a metallic

copy. Take care to instruct the founder to keep the metal cast as thin as he conveniently can for the double purpose of saving cost and excessive weight. Metal castings are done at so much per pound, varying from 7d. to 1s., according to the state of the metal market, and the nature of the metal employed. What is technically termed "gilding metal," a species of soft brass, is well adapted for this kind of work, as it takes a sharp cast, can be easily worked on with a file if required, and stands well in embossing. But we believe our modellers will not trouble the metal founder, in which case the electrotypist comes next under consideration.

In every way, as already observed, excepting the expense, an electrotyped die recommends itself to the map embosser. It is a faithful copy, both in size and features, of the model, and very durable; but, alas, like most good things, it is very costly. The price for electro dies varies from 6d. to 1s. per square inch, according to the size and thickness required. For some dies I have paid £30 and £40, whereas, by a substitution, which I will presently describe, I now obtain matrices equally faithful for 4s. or 5s. Still it is necessary to the completeness of this article that I should describe the more costly process.

Imagine that we have resolved on having our die electrotyped, we must, in common prudence, test the accuracy of our modelling before embodying it in metal, to this end :—

Take the unmounted map which you have used as a reference while modelling upon the mounted one; place its face against a glass window, and, with lead pencil, trace the following points upon the back of the map : St. Bees Head, Cumberland; Flamborough Head, Yorkshire ; Dover Cliffs, Kent ; St. Catherine's Head, Isle of Wight ; and the Land's End, Cornwall. These will serve as register points for the whole map. Run a somewhat blunt penknife along the hill shading marking the summits of the Pennine Range, the Cumbrian Group, the Cambrian Mountains, and all the highest points in England, but do not cut quite through the map if you can possibly avoid it. Now soak the map in cold water, taking care not to obliterate the pencilled register marks. When saturated remove it from the water, and dry off the superfluous moisture with calico or a soft towel. Take the map carefully by two corners (an assistant is here desirable, if you have one let him take the opposite corners), and lay it upon the plaster die so as to fit the coast line as nearly as possible. Test your accuracy by pressing with the fingers upon St. Bees Head, and move the map cautiously to and fro till the die fits the pencil mark at the point named. When this is done, proceed in like manner to Flamborough Head, Dover Cliffs, St. Catherine's Head, and the Land's End. These satisfactorily registered, secure your map in its place by pasting long slips of paper on the sides of the map, and turning them down at right angles, so as to affix them to the sides of the die. Paste the back of your map evenly and thoroughly ; then, with your fingers rub gently along the coasts, lowlands, and small elevations, and proceed gradually till you reach the greatest heights, or, to speak more accurately, the greatest depths of your die. Cautiously break the portions which have been partly severed by your penknife, and lay the divided parts in their natural positions, east and west, or north and south, as the case may be. Press them firmly down into the die, then cover the fractures with narrow pieces of soft white paper, *torn, not cut*, at the edges. Paste these slightly before laying them on, and with a modelling tool, judiciously used to prevent breakage, sink them into the depths of the die that remain exposed by the fractures which you have made by your cuttings in the map. Go over the whole again with your paste brush and fingers. Very stiff modelling clay should be ready, and with pieces of this, properly formed, press firmly down into every part, thus making the clay serve as a "force," *i.e.*, a means for pressing the paper well into its place. Fill in the land evenly everywhere with your clay, smoothing the work off exactly to the coast, and bring all up to a perfect level. Paste over the whole. Take a millboard or smooth panel of wood of the proper size ; paste this also, and lay it upon your embossed map, rubbing it firmly on the back in order to completely attach the two. Cut away the slips that have secured the sides of your map to the die, and get an assistant to raise the die gently on one edge to bring it to an angle of about forty-five degrees, yourself, meantime, holding the mounting board firmly to the embossed map. Now gently lift your work from the mould, taking especial care not to allow the tops of the hills to touch anything, or in their present soft state they will be damaged. You have now an embossed map before you ; doubtless very bluntly executed, but sufficiently defined to enable you to check the accuracy of the river courses, which are the chief points in which errors are likely to occur. If all be well we can proceed to take our next step, and if errors are discovered they can now be rectified by cutting away portions of the die where required, or by filling in with liquid plaster and your pencil any objectionable point. Proofs of corrections may be taken on plain wet paper and modelling clay, as just recommended in the embossing process ; practice will soon enable the constructor to read and rectify a die as well as a model in relievo.

The plaster die being completed and dried, we must now take an apparently retrograde step, in order to prepare the work for the electrotypist.

Warm the die before a slow, clear fire, then melt

beeswax in a tin or other suitable vessel, and, with a spoon, pour it over every portion of the face of the die. The plaster, if well warmed, will readily absorb a considerable portion of the wax; the residue will disappear on the die being again held before the fire. It will be well to repeat the waxing a second time, which done, and the surface completely cooled, brush olive oil over every part; edge it around with your wooden strips, and take a cast in fine plaster according to the directions already given. But this cast need not be more than one and a half inches in thickness. Let the cast remain the same time as previously recommended, then lift it from the die, and if your work has been successfully performed, you will have a faithful copy of your original model in spotless white. This relief cast must now be prepared for the electrotypist, which is done as follows:—1st, dry it thoroughly; 2nd, boil it in beeswax, which can be best effected by putting it into a deep tin dish, and placing it over a very slow, clear fire, with a sufficiency of wax to enable the whole of the plaster to become permeated with it; 3rd, when cool, clear every speck of wax from the surface, by holding the cast before a moderate fire if necessary; 4th, with a soft hog-hair brush, go gently and carefully over the whole of the sea and relievo portions, with the best blacklead in dry powder. The model is now ready for electrotyping. If you are not inclined to prepare the model, the electrotypist will do it for you at a small extra charge. The reasons for the several steps in the process are:—1st, the boiling in wax enables the plaster cast to resist the liquid of the bath, in which the electrotyping is performed; 2nd, the blacklead on the surface, being metallic, attracts the copper, which is held in solution in the electro bath, and thus a deposit is made which forms the die.

Electro dies are made of various thicknesses, from that of sixpence up to $\frac{1}{8}$ of an inch. The time required for producing these, varies from four to five days to a fortnight. After the electro is taken from the bath it is "backed up with" lead. This is done by laying the electro, face downwards, on a hot iron plate, well secured around with a metal edge, in the same manner as the wooden edge is used in casting in plaster. Soft solder, or other amalgam is then worked over the whole of the back, and upon this, by repeated, judicious pourings of molten lead, a solid even block is formed, which effectually protects the die and fits it for being embossed from. But, although the description of the art we are treating of, would have been incomplete without the foregoing paragraphs on electro dies, we think that after reading the following, on Parian dies, metallic work will seldom be resorted to. The method I have practised is as follows:—

Prepare the relief plaster cast by waxing, as described in the last paragraph but one. Build up your wooden edges 4 inches in height. Oil the model after waxing, very carefully, also the inside of wood. Be very sure that all corners are completely stopped, and every crevice that there may be between the edges of the wood and cast.

Take fine plaster of Paris; to every quart of this add a dessert-spoonful of alum, in powder; mix thoroughly, then with lukewarm water, as already described, prepare your plaster for casting. Take care to have sufficient mixed, to cover the mountains at the first cast. When this is fairly set, back it up by a second casting in coarse plaster, making the total thickness about 4 inches. At the proper period, *i.e.*, when firmly set, scrape the back off to a perfect level. In brief, proceed exactly as recommended in the paragraph, on taking the first die from the original model. When ready, remove the die from the relievo, and when perfectly dry you will have a die nearly as hard as marble. The addition of the alum to the plaster has produced the celebrated Parian Cement, and such is its fitness for geographical embossing, that I have repeatedly taken 500 impressions from one die, with very trifling deterioration of the original sharpness.*

It will here be doubtless said: such a die will neither stand a blow from a stamping press, nor pressure by screw or hydraulic power. Perfectly true! But as I use neither of these forces the objection will presently be found inapplicable. Let us proceed with the casting.

It is advantageous in every way to wax the surface of the Parian die, as recommended for the plaster one; namely, by warming it before a fire, and pouring melted beeswax over the whole surface. Be specially careful that this reaches the extreme depths. Very little wax will be required here, as the Parian is much less porous than plaster.

The Parian die being in readiness, we must now obtain what is technically known as a "*force*." This will require some explanation, which I will now proceed to give for the information and benefit of the amateur map-moulder.

Gutta-percha is admirably fitted for this purpose. Procure a sufficient quantity at any percha warehouse, or at a leatherseller's. The ordinary kind, in sheets, such as is used for soles of shoes, is good enough for our purpose. Price about 2s. per lb. Three-eighths of an inch will be a convenient thickness. You can ascertain the quantity required, by measuring the length and breadth of your die, and allowing half as much more in area for the extra thickness of the depressions.

* The addition of the alum causes the plaster to be very much longer in setting. Watch it from time to time, and in no way seek to hasten the work. Be careful not to attempt the second casting till the first is well set.

Cut your gutta-percha into pieces of three or four inches square, put them into a saucepan, or other vessel, of boiling water. Let them remain, stirring occasionally with a stick, till all is completely softened. Take the mass from the boiling water with a stick or large spoon. Have ready a board, or the top of a table, well wetted with cold water; place the boiled gutta-percha upon it, and when it can be handled, knead the whole into a compact mass. During this operation it will be necessary to frequently wet the hands in cold water to prevent adhesion. When about half cold, and getting a little stiff, but can still be easily worked, roll it out into a cake about three-fourths the size of the surface of the die (a round rule or wine bottle is well adapted for doing this). Rub a piece of soap over the surface of the gutta-percha, then lay it carefully, the soaped face downwards, upon the middle of the die.

Now, quickly, but not at all hurriedly, with the fingers and knuckles, press it firmly down into all the depressions, taking especial care not to move the gutta-percha to and fro. Roll the back off level, and smoothly spread the gutta beyond the extent of the land; if there be sufficient to cover the whole of the sea, so much the better; but this is not essential. The gutta-percha will soon cool. It is a good plan to lay one of your casts, back downwards, upon it while setting, as it will prevent warping. Do not be in a hurry to remove your work, as it will appear quite hard on the outside, while soft in the great depressions. From half an hour to an hour, according to thickness, is usually sufficient. When perfectly cold it may be lifted with ease.

If all has gone well, you will now have a perfect model in gutta-percha. If you have failed, cut up your gutta-percha, boil it again, and persevere till you do succeed. Remember that success in this simple operation depends almost entirely upon using the gutta at the right time, *i.e.*, when about half cold, but not so much so as to be refractory in working. If too warm or too cold, a blunt impression is sure to be the result. I have heard many complain of the difficulty of obtaining sharp impressions from this material, but there is really no difficulty if this one point is carefully attended to. Of course, care and strict attention to the instructions given are absolutely necessary, but if the first attempt be somewhat of a failure, the amateur must not be disheartened, but try again.

It often occurs that an excellent force is obtained, save in a few points. In such cases, I advise that the entire "force" be retained, and impressions be taken of the defective parts, which can be used separately after the whole "force" has been employed, as will be explained in the next paper.

(*To be continued.*)

AN "ARRANGEMENT IN BROWN PAPER."

SUGGESTIONS FOR INEXPENSIVE FRAMING FOR PRINTS AND ETCHINGS.

By J. W. GLEESON-WHITE.

DURING a past dispute between two men of light and leading, concerning the merits and demerits of certain harmonies in blue and silver, and arrangements in grey, a brochure was issued in defence of his works by the artist who considered himself insulted, clad in covers of homely brown paper, which was happily nick-named by the phrase I have taken for my title—one which, from its utter lack of any definite hint of the subject, may be, to an ordinary mind, in keeping with the first cause of the pamphlet itself.

But the arrangement here to be talked over and suggested (though by chance first applied by myself to a charming etching by Whistler) has no other connection with the *cause celèbre* than a vague trace of the picturesque, and refers to a somewhat novel application of an old rough and ready way of framing pictures that has often been used before, but hitherto chiefly in connection with very common and small articles, pictures only by courtesy, proving, however, capable of a different treatment, and admired by many artists and art lovers; it has been also (sincerest flattery) imitated by nearly every person who has seen it, that to the many who now may first make acquaintance with it, it will, I hope, prove acceptable from its two great merits—cheapness and simplicity.

In almost every home now one finds prints, etchings, pencil drawings, or photographs, sometimes issued with a popular periodical, or reminiscences of travel that are, while not quite worth framing, yet too good, or with too pleasant associations to destroy. These linger on, having no definite place, never to be found when required, and helping rather to litter than beautify the house, until they ultimately disappear in that mysterious visitation, known familiarly as the "spring cleaning," when so many valuable treasures swiftly and suddenly vanish away, and never are heard of again. If these forlorn pictures were once framed, or kept with the intention to do so at a quiet time, not only would they be spared the sad end to which I have referred, but the habit of taking care of them once formed, would lead to the finding and saving many other suitable subjects. It is astonishing how any idea, once adopted, finds unexpected possibilities arising out of the ordinary events hitherto unnoticed, and until one begins collecting any object, it seems that there must have been less of it in the world, by the sudden appearance in hitherto unsus-

pected quarters, of desirable and very often easily procurable specimens.

But without further preamble it will be best to explain the proposed method. Take an ordinary drawing or print, say, for example, of the etchings issued as frontispiece to the *Magazine of Art*, or "British Ballads," Herkomer's "Touched," given with a volume of the former work, will be an excellent sample, or Halliday etching issued with Part XIV. of the latter serial, and see how it can be framed for literally a few pence.

First mount the picture with ordinary paste on a piece of smooth cardboard. Any colour, plain or printed, will do if it has only a fair surface, and enough thickness to withstand the warping; let this cardboard be the size of the print (that is, the actual black and white picture, regardless of the margin it possessed in its first state) with an outer margin of equal width all round. In "Touched," the print itself is $5\frac{3}{4}$ by $7\frac{3}{4}$ inches, allow a clear 3 inches each side, making the size of the mount $11\frac{3}{4}$ by $13\frac{3}{4}$ inches, paste the picture (without cutting off the old margin as it may be useful for references and will be hidden) in the exact centre. Then take a piece of the grey mottled cardboard, now so much used and so easily obtained, cut from the centre a piece either $5\frac{3}{4}$ by $7\frac{3}{4}$, or $6\frac{1}{4}$ by $8\frac{1}{4}$ inches at will. Some prefer the grey mount to touch the picture everywhere, others like a narrow white border with the name of the artist, etc., showing. This is, I think, only to be decided by the character of the drawing, as some are much improved by allowing no other white than that left in the drawing to destroy the value of the tones of the picture itself. Having cut the grey mount, take a piece of rough millboard, the top of a draper's box or other available material, cut it $11\frac{3}{4}$ by $13\frac{3}{4}$, and at the distance of $\frac{3}{4}$ inch below the top, and, say, $3\frac{1}{2}$ inches from either side, cut two short upright slits with a sharp penknife, and pass a piece of narrow tape through them; this will lie flat on the surface, and should be tied behind in a knot close to one of the slits, so that a firm and unobtrusive support is left to suspend the picture when complete. Then having procured a piece of glass $11\frac{3}{4}$ by $13\frac{3}{4}$ inches, the size of these three pieces of board, lay the millboard flat on a table, above that place the mounted etching, then over that the cut-out mount, and the glass above all. Next cut some thick brown paper into strips of about an inch or inch-and-half wide: thoroughly paste these and bind the four thicknesses together, the brown paper showing about half-an-inch all round in the front, and well over the back, being cut in mitre fashion at the angles. When dry it will be ready to hang; and, after cleaning off any paste-marks from the glass, will be found a very pleasing little picture, unpretentious in appearance, the framing being not unlike a plain oak frame at a distance, and an ornament, or at least no disfigurement in itself, apart from the actual etching, in any room it may find itself.

Pictures so treated would be useful not only for the owner's house, but (as I have found) find a very ready and profitable sale at bazaars, and make inexpensive and much-liked gifts for friends; moreover, they also find a warm welcome in the homes of the poor, as any visitor to them knows that a love for pictures, amounting almost to a passion, exists among the most squalid and unlovely surroundings.

The cost of the etching, "Touched," is 6d., the glass at most 4d., the cardboard perhaps 2d. or 3d.; so that for little more than a shilling a really beautiful picture may be bought, framed, and hung on any wall. Contrast this with the price for the commonest "Dutch" metal frame, or the once all-popular "Oxford" one, and it will be seen that it is barely half the cost of the frame itself, not counting the print, while the art-beauty of the one is beyond comparison, as a little print in gilt frame is more or less an eyesore anywhere, while this simple substitute is sure to find favour with all or nearly all; and for those who dislike it, I was going to say, so much the worse for their taste, but remembering in time that abuse is no argument, and as a disciple of the "higher culture" (for who, writing under such a heading, could forget the necessity of living up to it?), it is only in keeping to ignore and refuse to allow even the possibility of the other side of the matter—certainly, if monotonously insisting that the "pictchaw is beautiful" be what will be said against it.

But this does not exhaust the possibilities of brown paper. Another way is worth noting. If the old gilded moulding, fly-specked and tarnishing, is well reclothed with brown paper, soaked with paste and well stuck on, so that it shows every feature of the moulding, it gives a very presentable appearance. The paper should be pasted some few minutes before use, and thoroughly moulded on to the wood. Each hollow and fillet will be seen sharply defined, and the whole will dry hard and, while unlike paper, look somewhat like oak, and present a certain fresh character of its own, not attainable in any other way. In this case the brown paper itself is a pleasant variety to the grey mottled card for the cut-out mount and an ideal setting to many wood engravings, as it gives such value to the blacks and whites of the print, in the same way that a good photograph gains by a dark, dull mount.

A more ornate way of adapting the same idea would be to add to the binding of brown paper a strip of plush or velvet entirely hiding it, and put on after the paper is dry with a touch of glue or mend-all along

each edge of the brown paper, the velvet or plush being put on when the adhesive substance is nearly dry, or "tacky," as it is technically called. For some subjects the velvet margin might be wider, and touch the line of the drawing or photograph itself with good effect.

To those who live in our larger towns a constant opportunity of picking up suitable engravings presents itself, as almost any old bookstall has some part of an illustrated magazine or frontispiece of an old and valueless book that is well worth securing and utilising in the way suggested. It may not be an early Durer, a noted Rembrandt, or a Meryan in a fine state, that is to be found; but pictures less valuable, in a money if not an art sense, may often be met with. I came across a copy of Flaxman's "Eight Illustrations to the Lord's Prayer" (an early set), for a few pence; and a nice Bartolozzi or bits of Claude's "Liber Studiorum" are often to be bought (out of the common run of tourists), very cheaply.

And now, in concluding this article, as I run my eye over it and wonder if I have not said too much in praise of my idea, I look up and see a long, low gallery, hung with a greenish-grey paper, with here and there a shelf of blue and white pottery or a few Dutch tiles catching the light. I see that half its charm lies in the pictures that I have framed in the "simple brown paper," and feel that "The Sappho," "Sunflowers" and "Quiet Counsellors" of Tadema, Arthur Moore's "Pansies," Leighton's "Daphnephoria," Burne-Jones's "Studies," and a Meryan ("Notre-Dame"), are a true source of beauty and pleasure; for that, if it had entailed the cost of some thirty frames of even the simplest sort of wood, would have been sadly but of necessity foregone; and so with the proof positive so near, I offer no apologies for my much-lauded method, but hope that many a reader of this will follow the example, and thank me inwardly for suggesting this "Arrangement in Brown Paper."

HOUSE PAINTING AND PAPERING.

By GEORGE EDWINSON.

II.—CLEARCOLING—WHITEWASHING—PRIMING WOODWORK—PUTTING IN NEW SASH-LINE—STOPPING.

WE left our readers with ceiling and walls clean, and will now proceed to clearcole them. *Clearcoling* is a process of sizing the work to render it smooth and non-absorbent, and thus assist in producing a clean finished surface; it also prevents the walls from sucking the paste off the paper. Some persons entirely neglect this process in common work, and not only spread the distemper over unsized tops, but also hang the paper on unsized walls; but good work is always clearcoled.

Clearcole for walls and ceiling is prepared as follows:—Procure 2 lbs. of best whiting (price about 2½d. per dozen lbs.), put in a pail, pour some water upon it and allow it to soak, whilst it is soaking place 7 lbs. of best size (price 2d. per lb.) in a vessel over the fire, with a little water to keep the size from burning. When the size has all melted, and is free from lumps, pour off the water from the whiting, beat it into a thick paste with a wooden stirrer, then pour in the melted size, stir well until all is thoroughly mixed, and then strain through a piece of coarse muslin, coarse canvass, or a similar porous material such as the top of a white cotton stocking.

Having prepared the mixture we must again erect our platform, and proceed to clear wash all the ceiling whilst the mixture is warm, using the brush Fig. 1 or Fig. 2, and laying on the wash uniformly thin and smooth, then treat the walls in like manner. In this work we shall learn how to handle the brush, and thus get the hand in training for the subsequent laying on of the colour. Do not put on the wash as with a trowel, nor dash it on as from a ladle, but draw the brush, charged with the wash, evenly, firmly, and smartly along in straight lines, allowing the second stroke to slightly overlap the first, and keeping the wet work between your line of vision and the light. After laying each stroke of wash, take another stroke over it very lightly, with a slightly curved sweep, allowing merely the tips of the hairs to touch the work, and thus leave a smooth finish.

Whitewashing or Distempering.—Properly speaking, painting in distemper or in colours not mixed with oil. The word distemper covers all preparations of whiting and size, whether tinted with colour or not, but whitewash refers chiefly to lime-wash, or a mixture of lime and water. We shall treat of lime-wash when we have to deal with out-buildings and cellars; here we shall treat of the most approved paint for ceilings, known as distemper. Distemper for ceilings is prepared in nearly the same manner as the clearcole, just mentioned. The quantity required for the ceiling of an ordinary bedroom, and the method of preparing it, are as follows:—Get 12 lbs. of best whiting, put it in a pail and pour water on it until it is soaked and covered with water, let it stand thus for half an hour, then pour off all the water and beat the whiting into a smooth paste, using a smooth stick for the purpose. Meanwhile set 3 lbs. of best jellied size over a fire in a vessel containing a little water to prevent the size from burning. When the whiting has been got into a smooth paste, and the size has melted to a clear liquid, stir in the melted size until

both ingredients are well incorporated. It should be known that distemper thus prepared, without any colouring pigment, will dry yellow; to make it dry white, we must add a little blue or black pigment. Get one halfpenny worth of blue, black, or one halfpenny worth of ultra-blue, and mix half of it with some of the whiting, to form a paste; now grind it with the palette-knife on a smooth stone until it has become a smooth paste, add some more whiting, mix well together, and then stir it with the bulk of the whiting before the size is added to it. The whole mixture must now be strained through a piece of coarse stocking material, a piece of muslin, or a close meshed sieve, then set aside to cool, until it is of the consistence of jelly, when it will be fit for use. When the colouring pigment is not worked up smoothly, and the distemper is not strained and thoroughly mixed, little balls of the blue-black will become enclosed in whiting, like little eggs in a shell. This shell will break on the ceiling and leave their contents in the form of long unsightly dark streaks.

Having prepared the distemper we must again mount the platform, and proceed to lay it on with the same brush, and in a similar manner as in clearcoling, but with the following additions—Close all windows and doors to exclude draughts, which may dry the work too fast, and in patches. Work with your face to the source of light, and work backwards away from that light, so that the light may fall on the edge of each stroke unshaded by brush or hand. Do not take up too much distemper on the brush, lay it on in straight strokes evenly, and shade off each stroke lightly as before, with the tip of the brush. If the ceiling seems to suck at the distemper and cause the brush to drag, mix a little water with the stuff until it works more smoothly. See that the work is of one uniform dark tint, inclining to blue, it will then dry uniformly white, but do not go back over any patch after the ceiling is finished. When it has all been covered, throw open windows and doors to quickly dry the work, and proceed to clean the woodwork and prepare it for painting. To clean and prepare the old paintwork, we shall require a lump or two of pumice stone, plenty of clean water, a sponge, or a handful of rags, a knife shaped like a broad bladed chisel, Fig. 4, and a stopping-knife, Fig. 3 (see page 111). First go over all the woodwork and examine its condition, pare off all blisters with the knife, remove any lumps of putty or dirt, moisten any greasy spots with turpentine, extract all nails, and clear out old defective stoppings. In doing this kind of work avoid roughing the wood with the knife, which should be used as a plane is used in paring off excrescences. Next go over all the paintwork with a lump of pumice stone, and use this as a scrubbing brush should be used, frequently moistening it in the pail of clean water, and working its face over the paint with a circular motion of the hand. Occasionally face the stone on a piece of Portland stone when it appears to have lost its cutting properties. The use of this agent is to wear down all inequalities, except those requiring stopping, and to give a smooth surface to the paint. Remove the dirt from time to time with the sponge dipped in clean water, and repeat the scrubbing and sponging until a smooth surface has been obtained.

Priming the Woodwork.—This, strictly speaking, is confined to the preparation of new woodwork for the second coat of paint, but a similar preparation is necessary after cleaning old paint before it is "stopped" and smooth for painting.

The preparation of new work will be noticed further on, at present we have to deal with old painted woodwork, and to prepare it with a "second coat." The paint, or "colour," as it is technically termed, for this kind of work, is composed of white lead worked into a liquid of the requisite thinness with a mixture of raw linseed oil and turpentine, equal parts of each, and the whole tinged to a flesh tint with red lead. If the colour is bought ready mixed at the oilshop we shall require between five and six pounds to paint an ordinary bedroom; but we must say here that correct estimates as to quantity cannot be given because the quantity required will vary with the size of the room and the surface of wood to be covered. As to prices, white lead will cost about 3½d. per lb., red lead and driers about the same price, whilst linseed oil will cost about 2s. 8d. per gallon, and turpentine 3s. per gallon. If the ingredients are bought separately they should be mixed as follows:—Put 5 lbs. of white lead into an earthenware colour pot (Fig. 13), price 4d. or 5d., mix a quart or more of equal quantities of oil and turpentine, pour some of the mixture on the white lead and work it with a stout wooden stirrer (Fig. 11) until a perfectly smooth but stiff mixture has been obtained, then add more of the oil mixture, and stir again until it is thin enough to be strained. Tie a piece of coarse cotton stocking material, or of muslin, over the mouth of a paint pot, pour the mixture on the strainer and work it about with a brush until only the rougher particles remain on the top. Then take off the strainer and stir in about four ounces of driers ground in oil, to this add enough red lead ground in oil to give it a flesh tint, and finally dilute the mixture with enough oil and turpentine to make it thin enough for use. We shall treat of colours and their preparation further on in a chapter devoted to this subject. At present we suppose the reader able to procure the materials already ground for mixing, and therefore he will not require a muller, a slab, nor a palette-knife, but the latter tool will be found handy in mixing small quan-

tities of colour for tinting the paint, I therefore give a sketch of one at Fig. 12, price, about 1s. 3d.

The tools required to lay on the paint will be a brush known as a pound brush (Fig. 9), price 3s. 6d., used to spread the paint on doors, window-frames, wainscoting, and similar large surfaces; a large sash tool (Fig. 7), price 1s. 3d., used in painting the broad parts of sashes; a small sash tool (Fig. 8), price 8d., and an outside sash tool (Fig. 19) used in painting the narrow frames of the window-panes and other similarly fine work. The paint, or "colour," is generally carried about and held in a paint can, as Fig. 14, price 5d. or 6d., but all paint pots must yield the palm to a small tin pail (Fig. 15), price about the same as an ordinary paint pot or can, with the advantage of being much more handy, the broad expanding top and sloping sides admitting a cleaner dip of the brush or tool. Fig. 10 shows a large brush similar to a pound brush, and procurable at the same price, or perhaps 6d. cheaper; this is the dusting brush, used, as the name implies, for brushing the dust from woodwork before it is painted. If this is not done the dust will mix with the paint and give it a gritty appearance and ruin delicate tints. Some persons use a dust brush for this purpose until it gets half worn out and then advance it to the post of paint brush, but this course is not to be recommended in any other except coarse work, for the rough usage of a dust brush often loosens the hair or wears it unevenly, and a brush thus used is

FIG. 7.—LARGE SASH TOOL.

FIG. 8. SMALL SASH TOOL.

FIG. 9 — POUND BRUSH.

FIG. 10 — DUSTING BRUSH.

FIG. 11.— WOODEN STIRRER.

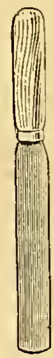


FIG. 12.— PALETTE KNIFE.

FIG. 13.— COLOUR POT.

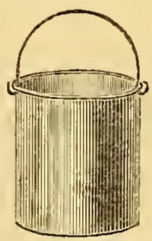


FIG. 14.—PAINT CAN.

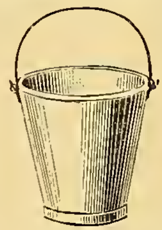


FIG. 15.—PAINT PAIL.

FIG. 20.—CHISEL.

FIG. 22.—NEW TOOL TIED WITH CORD.

FIG. 19.— OUTSIDE SASH TOOL.

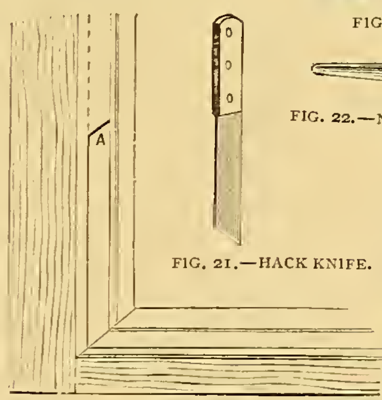


FIG. 21.—HACK KNIFE.

FIG. 18. CORNER OF WINDOW FRAME. A, Entrance to Weight Box.

FIG. 16. PUTTY KNIFE.

FIG. 17. PUTTY BOARD.

sure to hold some dirt. All new tools and brushes should be bound around with cord, as shown at Fig. 22 until their tips have been worn.

If we call in the painters and get them to contract for painting a room, or several rooms of a house, it is rarely that they will do anything besides laying on the paint. If the beading of a window is loose they will paint it in that condition, for they do not consider it their duty to drive a nail; if they undertake to paint a room they will not paint the outside of the door nor the outside of the window unless it is specified in the contract; if the sash-lines and window fastenings need repair, and the panes are loose for want of a bit of putty, that is no part of their duty; they may draw your attention to it in a friendly way and say it ought to be done, or pass on leaving it unnoticed. But amateurs will not feel themselves tied by any such trade customs, and it will be well for them to see to these matters before putting on any paint. If the sash-lines are much worn and appear in that condition usually termed "the worse for wear," it will be well to replace them with new ones. Cord for this purpose is sold at the oil-shops, or Italian warehouses, at 10d. per dozen yards, in various sizes to suit the grooves of the sash-pulleys; it will be well, therefore, to note the size of the groove, before procuring the new cord, and also to estimate the length required, getting a few feet over, rather than under the requisite quantity.

To Put in a New Sash-line.—To be on the safe side and to avoid breaking a pane or two of glass, it

will be well to provide yourself with a mate, then proceed as follows :—If the broken line belongs to the lower sash the job is a simple one ; get a wood chisel (Fig. 20), a blunt one will do, and if you have a choice of chisels select an old blunt chisel in preference to a new sharp one, because the latter will be most surely blunted, and perhaps have a broken edge to boot, before the job is finished. Insert the edge of the chisel between the beading and the window frame, and gently ease the beading off by using the tool as a lever, commence about half-way up and ease off a small length at a time, you will soon draw the nails, then gently bend the beading outwards in the form of a bow, slip the lower end out of the notch at the bottom of the frame and take the beading off, if this is done carefully no marks will be left to show that it has been done after the beading is replaced, nor will the beading be broken. The sash may now be lifted and moved inward at one end, leaving the other end held by the sound sash-line ; whilst your mate holds the sash open as a door would be opened, search near the bottom part of the frame for a crack (shown at A, Fig. 18) indicating that a piece of wood has been let into the frame, remove this piece of wood by inserting the edge of the chisel in the crack and levering it outward; if it does not come away kindly take off the dividing beading too, for perhaps this beading holds it in position. An opening is now made into the receptacle, or box, which holds the sash weights, and in this the weight will be found. Draw out the weight, untie the old line, measure off a corresponding length of the new line, or measure off this by the following rule : add from a foot to fifteen inches to the height of sash and cut the sash-lines to that length, *i.e.*, supposing the height of sash to be 2 ft. 6 in. cut the sash-lines 3 ft. 9 in., this will allow length enough for tying to weight and fastening to sash, and the bottom weight will then hang near the top of the lower sash. But we have now to fasten the line to the weight, and this should be done before the line is cut, how shall we get the end in over the pulley and down to the weight? We shall require a mouse to do the job for us. A "mouse" for this purpose is merely a long thin strip, or small bolt, of lead about the same diameter as the line, to this is attached the window-length of strong twine or whipcord, and the other end of the cord is tied tightly to the tip of the sash-line. Insert the mouse in the hole over the pulley, it will easily bend to the curve, and draw the whipcord after it, and after it the sash-line, feel for the mouse at the hole in the bottom of the box and gently draw the sash-line in through the hole over the pulley, fasten the line to the weight, draw it up until the bottom of the weight is half-way up, cut off the cord half-way up the window frame whilst you hold the upper portion in the left hand, tie a loop in it to keep it from slipping into the weight box, and let it run up whilst you get the sash ready for it. The broken piece of cord must be taken off by drawing the nails, and the groove cleared out for the new cord, then get a few "inch clouts," *i.e.*, broad, flat-headed nails, get your mate to hold sash-line in one hand and sash in the other whilst you nail the line with the clouts into its groove in the sash.

If only one line is broken or needing repair, replace the strip of wood and middle beading, replace the sash, then the outer beading in its place, by putting in the two ends, whilst the middle is bent, and a few taps with a light hammer will nail all close. If both lines are broken, the sash must be taken out and both ends receive similar treatment. If the lines of the top sash are broken or needing repair, it will be necessary to proceed first as for repairing the lower sash, and in most cases it will be best for the amateur to remove the lines from the lower sash, knot or loop the ends, take out the sash, and set it aside whilst repairing the lines of the top sash. The middle or dividing beading must be removed to repair the top sash-lines, then proceed as in repairing those of the lower sash.

Whilst we have the windows in hand, it will be well to examine the window panes and their settings, with a view to making all good before painting the sashes. Broken panes should be replaced with new ones, loose putty should be cleared out, and the panes re-set with fresh putty where required. The fragments of old panes should be cut out, and this is done with an instrument known as a "hack knife" (Fig. 21). This is made with a blunt back, and is used together with a light hammer, for striking the back of the knife, and thus cutting downward along the edge of the rabbet or frame of the pane through the putty. If the putty is very hard, and the window sash old, extra care must be taken in cutting out the old glass to avoid splintering the rabbet, and a sharp knife should be used, which should be worked straight down between the edges of the putty and the rabbets.

Most vendors of window glass will cut the panes to measurement, but the exact measurement must be given to ensure a proper fit. To cut glass an instrument known as a glazier's diamond will be required, and a T-square or straight-edge, and also a two-foot rule. The operation is simple enough, but amateur glaziers must expect to break a few panes, and also to cut their hands before they become proficient ; I therefore advise them to buy panes cut to size. When all the old putty and glass has been cut cleanly out, pinch off a few bits of new putty with the putty-knife, and spread them evenly along the edges, corners, and on the sides of the frame, then put in the pane of

glass, pass the fingers with a gentle pressure and with a shuffling motion over the pane, and make it bed itself level against the above-mentioned lining of putty. Then smoothly fill in the space between the edges of the pane and its frame with putty applied with a putty knife (Fig. 16); or, in lieu of that, use the stopping knife: let the putty lap the edge of the pane in a line fair with the supporting edge of the frame inside, neatly bevel it with the point of the knife, then trim and stop the roughness and crevices inside.

Putty is made with finely-pulverised dry whiting, sifted through a fine sieve, and mixed with raw linseed oil, to form a stiff paste, which is then kneaded with the hand as dough is kneaded, and allowed to dry for a day or two, it is then worked up again in small pieces, and if required for a very exposed situation a small quantity of white lead is mixed with it. Mr. E. A. Davidson says that a soft putty is made with boiled, instead of raw, linseed oil, and white lead is added in the proportion of one part to ten of the whiting; a little salad oil is also added to prevent the lead from hardening too soon and cracking off.

Putty may be coloured by mixing the required pigment, such as ochre or lamp-black, with the whiting. After putty is made, it should be kept in an earthenware pot, wrapped up in a wet cloth; and if it gets hard, it may be softened by heating it, beating and kneading it whilst warm. We have found the "soft" putty above-mentioned a most troublesome article in practice, and therefore forbear to recommend it. Putty made with well-dried and pulverised whiting, mixed with raw linseed oil, and allowed to mellow in a keg or cask for a few months, has no superior. We never colour putty by putting a colouring pigment in the whiting, but tint it by a process which shall be explained further on. It will be well to add that rabbets of window frames should have a coat of priming put on with an outside sash-tool (Fig. 19) after the old putty is cleared out, and before the new pane is put in, and the amateur should see that his putty is quite soft, and free from grit or lumps.

Stopping is merely a hard putty, containing a larger proportion of white lead than common putty. It can be bought, ready made, at 2½d. per lb.; and glaziers' putty at 1d. per lb.

Before we commence stopping the cracks and defects of the woodwork, we must apply a coat of colour—the "second coat" already mentioned, the first coat being already on old paintwork. This may be applied, with the pound-brush, to broad surfaces, or with the smaller brushes, where these are required. See that the wood is free from grit and dust before you lay on the paint, use the dusting-brush freely, clear out crevices and faulty places well, and give those parts which will require stopping special attention, dabbing the paint well into them. When this coat is dry, commence "stopping" defects. Where cracks are deep, give them the first attention. Armed with the stopping-knife and a lump of stopping held on a palette-board, or a board cut as shown (Fig. 17), proceed to press the stopping well into the cracks, and when they are firmly full, allow the stopping to stand above the surface of the woodwork. Next day, or the day after, go over all those deep cracks again, and you will find the stopping shrunk down nearly level in drying, and it can then be smoothed off with the stopping-knife or a piece of glass-paper. Where a dent has been made in the woodwork with a hammer, or by a blow from any other instrument, it will be necessary to prick the part with a bradawl or the point of the knife, to make a rough surface for the stopping; but this must not be continued beyond the edge of the defect; the stopping must then be pressed well into those holes, and the patch smoothed off level with the surrounding surface. Indeed, the aim of the process is to make a perfectly smooth surface for the paint.

When the stopping and coat of paint is quite dry, the work must next be rendered quite smooth by rubbing it down with glass-paper. To do this, get a sheet of glass-paper, wrap it around a piece of wood 4 by 3 by 1 inch, and use it as a scrubbing-brush on broad plane surfaces, until they are perfectly smooth. Wrap smaller pieces around shapes of wood, or of cork, suitable for use in mouldings, and on the edges of panels, or round the finger for more intricate parts, as on the window-frame. Thus continue until all has been rubbed down smooth; brush off all dust caused by this process, and then proceed to lay on another coat of paint.

(*To be continued.*)

HOW TO MAKE A CYLINDRICAL ELECTRICAL MACHINE.

By C. J. CLARK.

WITHOUT any preliminary or unnecessary remarks, I shall at once proceed to show how anyone may make, at a moderate outlay, a small electrical machine, by means of which a severe shock may be sent through as many as a dozen or more people who are joining hands.

The first thing necessary to be procured is a small cylinder. One about 6 in. long by 3½ in. in diameter

may be bought at Messrs. Townson and Mercer's, 89, *Bishopsgate Street Within, E.C.*, for about 1s. 8d., and larger sizes at proportionate prices. I may here mention that this house can supply any or all the requisite articles for the machine about to be described. Having procured the cylinder, take a square stick of any hard wood about one foot long, make it round like an ordinary blacklead pencil, only rather wider in diameter than the holes at either side of the cylinder, into which the stick will have to be placed. Try if the stick will go into the holes; if it be too large, reduce the size slightly by rubbing it with glass-paper. Again try if it will go into the cylinder; if still too large, rub a little more with glass-paper, but be very careful and not make the stick too small, for it must almost be forced the end of the centre stick to pass through easily. Next round well off the corners which are to be outside or furthest from the cylinder, *for in all electrical machines there must be no corners nor rough edges, everything must be well rounded off. This is an important condition for the successful working of the machine, and I would call the reader's particular attention to it.*

If this cap now fits well, make another exactly similar for the other side of the cylinder, and in order to keep them in a fixed position, a small French nail (the head of which has been previously taken off) may be driven through the cap into the wooden stick.

The next operation will be to make a handle to turn the cylinder. For this purpose take a piece of

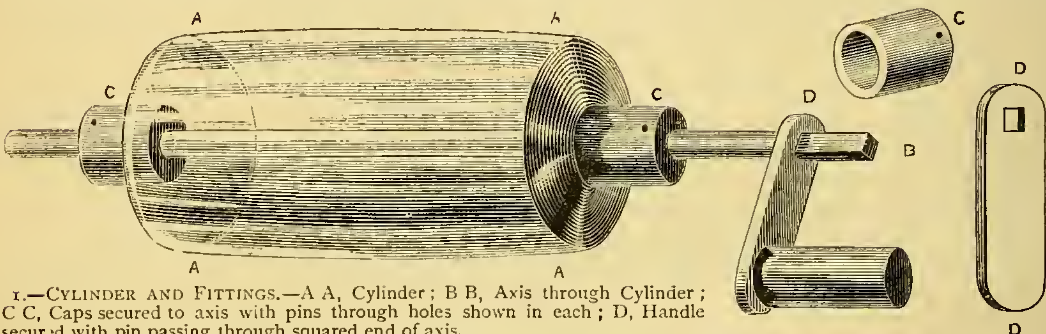


FIG. 1.—CYLINDER AND FITTINGS.—A A, Cylinder; B B, Axis through Cylinder; C C, Caps secured to axis with pins through holes shown in each; D, Handle secured with pin passing through squared end of axis.

FIG. 9.—THE PRIME CONDUCTOR.

into the cylinder, for when the machine is in work the stick will act as a pivot for the cylinder to turn on, and consequently must fit so tightly that it would be almost impossible to move it.

Assuming the stick is in the cylinder, with an equal length being left on each side, and that it is so closely fitted that it will not move, the next thing to be done is to make two caps. To do this, take a square piece of hard wood about $\frac{3}{4}$ inch larger than the outside measurement of the necks of the cylinder, round off the corners with a rasp or file until you have made it look like a lead pencil uncut—that is to say, a roller with each end quite flat. Now mark on one of the flat ends the size of one of the necks of the cylinder, and hollow out the part so marked with a chisel or other convenient tool as deep as the neck of the cylinder. Having done this, bore a hole through the remainder of the block, but large enough *only* to allow hard wood, say 5 inches long, $1\frac{1}{2}$ inch wide, and $\frac{1}{4}$ inch thick when finished; at one of the ends cut a square hole just large enough to admit one of the ends of the sticks which runs through the cylinder, which of course will have to be squared to the same size, and about $\frac{3}{4}$ inch down, so that when the handle is put on the cylinder, there will be $\frac{1}{2}$ inch of the squared stick extending beyond it. Make the handle fit as accurately and as tightly as possible, for if it should get loose while working the machine, it will cause endless trouble and annoyance. When the handle is on, drive a headless French nail through the centre stick outside the handle, and as close to it as possible, so as to prevent it coming off again.

To complete the handle, take a roll of wood $1\frac{1}{2}$ inches in diameter and 4 inches long, round off the ends, and fit it with an ordinary screw to the other end of the part already joined to the cylinder. It is of

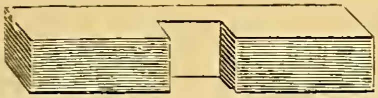


FIG. 2.—FOUNDATION OF CUSHION.

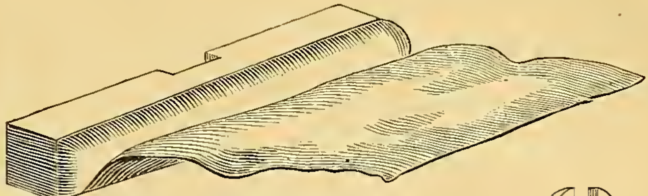


FIG. 3.—THE CUSHION WITH SILK FLAP.

FIG. 14.—CAP, WITH BRASS ROD, ETC.

FIG. 6.—UPRIGHT FOR HANDLE-END OF AXIS.

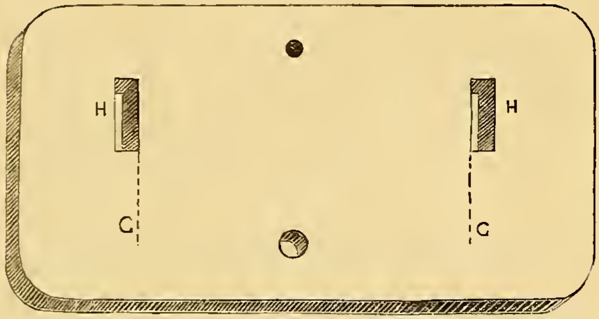


FIG. 4.—FOOT-BOARD OF STAND FOR CYLINDER.

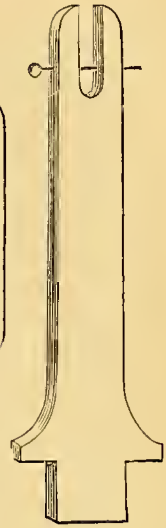


FIG. 5.—UPRIGHT.

FIG. 13.—WOODEN CAP FOR JAR.

FIG. 12.—BRASS BALL, ROD, AND CHAIN.

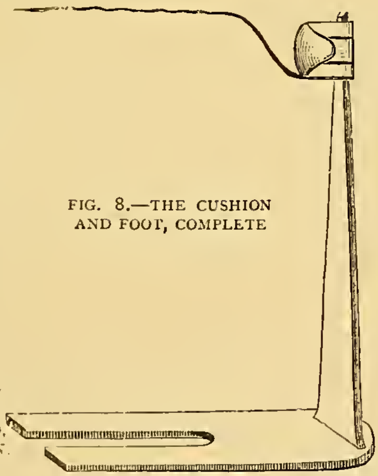


FIG. 8.—THE CUSHION AND FOOT, COMPLETE

FIG. 16.—DISCHARGING ROD.

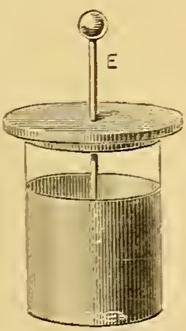


FIG. 15.—JAR COMPLETE, READY FOR USE.

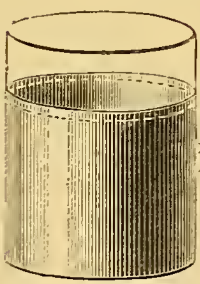


FIG. 11.—GLASS JAR COVERED WITH TIN FOIL. Dotted line shows height of foil inside.

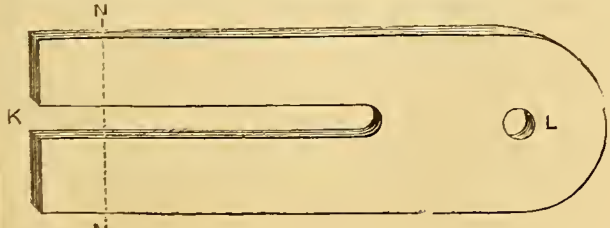


FIG. 7.—FOOT OF CUSHION

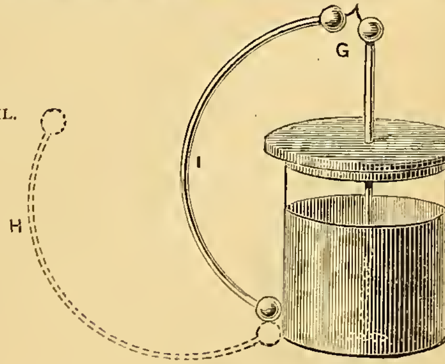


FIG. 17.—DISCHARGING ROD IN OPERATION.

course needless to say that this part of the handle must *not be fixed*, but must move freely, so that when it be turned, the part intended to be held will be unmovable in the hand. The sketches in Fig. 1 will help to explain more clearly the foregoing instructions.

The next thing to make is a cushion to rub against the cylinder. For this take a piece of wood ½ inch thick, one inch wide, and in length about 1 inch less than the sides of the cylinder. Cut a notch in the middle of the back of it, or, to speak more strictly, in the middle of one of the flat sides, and let the notch be about ⅛ inch deep, and nearly an inch wide. This piece of wood is shown in Fig. 2. Then cut a piece of coloured thin leather (which may be obtained of any bootmaker) one inch longer than the wood, and as wide as to go nearly round it. Glue this leather at the top and bottom of the wood, so that it passes over the front of the wood loosely, that it may be afterwards stuffed with wool or hemp, and form a soft pad. At the same time fasten up one end of the cushion by gluing the leather carefully and smoothly over it. Now let the glue dry, and when dry, stuff the cushion by the aid of a wire, and fasten up the other end with glue. It will next require a flap of leather and silk. Decide now which end of the cushion shall be the bottom, and that being fixed upon, glue a second piece of leather of the exact length of the cushion upon the first piece along the lower edge, but not anywhere else, observing that as the first leather had its coloured side outwards, this piece must have its coloured side inwards; and consequently it is the coloured side which is glued down to the former. When glued on, cut the flap, so that its upper edge shall reach exactly to the top of the cushion, and no further, then glue a piece of thin sarsenet along this upper edge, it will be wanted of the same width as the leather flap and four or five inches long. *It must be of a black colour, and ought not to have the edges hemmed.* The cushion complete is shown in Fig. 3.

Now that the cushion is made, it will be well to make the stand for the cylinder, and one also for the cushion. For the first of these, procure a piece of flat smooth wood, about 1 foot long and 9 inches wide, and an inch or more thick, round well off all the edges and corners and make them quite smooth, then measure the length of the cylinder with its caps on it along the piece of wood (measurement from the end of one cap to the end of the other, take no notice of the stick extending beyond), which I will suppose to be indicated by the dotted lines G, G in Fig. 4. On the outside of these marks cut two holes as at H, H, quite through the board. Then make two uprights as in Figs. 5 and 6. The lower end of each is to fit into the holes H, H. These uprights may be 8 inches above the board when fixed into their places. The upper end of one of them (Fig. 5) is to have a hole bored in it with a centre bit just slightly larger than the end of the pivot of the cylinder, which will revolve in the former. The end of the other upright (Fig. 6) is to have a slit made down the top (stopping on a level with the hole in the other one) for the handle end of the cylinder to rest in, where it is to be secured by a piece of wire passed through the upright when the cylinder is in its place—this wire is seen at I. Next procure a strip of hard wood 1½ inch wide, ½ inch thick, and 3 inches long, cut a hole along one part of it as at K (Fig. 7), and drill a hole ½ inch in diameter at another part, as seen in the sketch at L, then get a flat piece of wood, cut it at one end to fit the hole L, and gradually make it thin towards the top end, and let it be of the same length as the uprights. Glue it to the foot-piece as seen at M, and glue the cushion on the upper end of it, at such a height as that when the foot-piece is made to rest on the board of the stand, the centre of the cushion shall be of exactly the same height as the pivot holes in the uprights. Now put the cylinder in its place, and place the cushion against the side of the cylinder, resting its foot upon the stand, and letting the handle of the cylinder be to your right hand with regard to the cushion. To be quite clear on this point, supposing the cylinder to be lengthways in front of you the side for the cushion is the one nearest you, the side furthest from you (as we shall see later on) is for the prime conductor. Well, having put, as just stated, the cushion in its place, see that it is of the right height to reach the most projecting part of the cylinder, and that it is of the same distance from each end of the length of it. Hold it so close as to touch the cylinder, and make a mark on to the board, close to the end of the slit—say at about the dotted lines at N N. Bore a hole at this mark, and get a brass knob from any ironmonger's, which has a nut to fit the screw of it. The larger and stronger this knob is, the better. I may mention that the length of the screw must be ¼ inch shorter than the thickness of the cushion foot, and the foot-board together. Let the nut into the under side of the foot-board, to the depth of ½ inch. Now put the complete cushion (Fig. 8) in its place, and, putting the screw in the proper hole, it will hold the cushion securely, and the silk flap will go over the top of the cylinder. It is almost needless to mention that the width of the upright for the cushion is to be exactly that of the notch at the back of it, as previously described.

The next thing to make and fix is the prime conductor (Fig. 9). For this purpose get a round piece of wood about 6 ins. long and 2 ins. in diameter, cut and file the ends round, and cover the *whole carefully* with

tinfoil, which may be bought of Messrs. Townson and Mercer's at about 2½d. per ounce, stick it on the conductor with ordinary paste, cut it into notches at the ends, that they may lay over one another without any unevenness, let it get thoroughly dry, and then rub it all smooth with the handle of a knife. Now make a line along the conductor rather towards one end of it, and with a very fine bradawl make small holes along it about ¼ inch apart; into these holes drive pins (the heads having been previously taken off), leaving the points standing outwards about ½ inch. The sketch given in Fig. 9 will indicate this more clearly.

There may be about fifteen pins, and the whole length of the row may be rather less than the length of the cushion. Hold the conductor to the cylinder on the opposite side to where the cushion is, so that the end P may be to the right hand (looking at the side where there is no cushion) or the end removed from the handle. It will not be seen that the conductor, owing to the pins being nearer to one end than the other, will not be exactly in the middle of the stand. When it is so held, mark that which is the under side, the pins being towards the cylinder, and in that under side bore a hole, ½ inch or more deep, and the same in diameter, the position of the hole is to be equally distant from both ends of the line of pins. There is to be a small hole made at the longest end of the conductor, and a thick wire with a ball at the end of it, driven into it as represented at O. The ball and wire at the end of the conductor may be of any sort of metal, brass certainly looks best, but a piece of iron wire with a bullet at the end of it, answers every purpose. Brass balls may be bought ⅝ inch in diameter for 3d., or ½ inch for 4d.

The conductor is now complete, and ready to be fixed. To do this, buy a glass rod, half-an-inch or less in diameter, and as long as the uprights which will be about nine inches. This may be bought at the rate of 1s. per pound. Simply say you want nine inches of glass rod, of half-an-inch in diameter, and that quantity will be weighed and charged for accordingly. Having procured the rod, roughen both ends for about half-an-inch on a grindstone, or with a file, and cement one end into the hole underneath the conductor, and when fluid hold the conductor in its place, so that the row of pins is in the middle between the two ends of the cylinder, and mark where the glass rod touches the foot-board, bore another hole here, and cement the rod in, at such a height as that the points shall agree with the pivot and cushion, observing also that the hole should be so far back, that when the conductor is fixed, the pins shall be about a quarter-of-an-inch from the cylinder itself. Lastly, cut off the silk of the cushion in a line just above the row of pins. The machine is now complete, and if all the parts have been correctly made and put together, it will have the appearance shown in Fig. 10.

Assuming all this is perfect, there is no doubt that with a little contrivance and good management sparks an inch long may be obtained. To put it in work, it will be first necessary to make or procure a little electrical amalgam.

It can be made as follows: Get a piece of zinc about as large as a pea, melt this in a pipe, and add to it one ounce of quicksilver, which will be about five times as much. Stir them together, and when properly united, pour them on the hearth to cool; when cold, the mixture will be soft enough to break into pieces with the fingers, or to cut easily with the knife. This is ready for use, and will keep any length of time.

If it is thought too much trouble to make the amalgam, it may be bought ready for use for 6d. per ounce, which quantity will go a good way.

To apply the amalgam, take off the cushion, grease with the end of a tallow candle that part of the flap which goes next to the cylinder (the leather part, *not* the silk), taking care that it is applied very sparingly. Then spread a little of the amalgam over the flap which has been greased, till it presents a bright metallic appearance—this amalgam should extend from one end of the flap to the other, but not be above half-an-inch in width along it.

This being prepared, put the cushion in its place, and then let the whole machine be well dusted, and then placed before the fire so as to get gradually and equally warm all over. Dust it well again, lest any ashes should have settled on any part of it, and do this with a very dry warm *silk* handkerchief or a piece of flannel (the former is preferable), and particularly see that the *ends of the cylinder beyond the cushion, and the leg of the conductor are quite dry.* This is most important as a little breath even on the rod of the conductor would cause a failure. Fasten the cushion, so that it presses slightly against the cylinder, remove the whole from the fire, and place it on the table. If the machine be in good order, any person who holds his knuckle to the ball of the conductor will receive a spark, immediately afterwards another and another, so long as the machine is being turned. It would be a good plan to have a clamp to the machine to fix it to the table, as then your left hand would be at liberty.

All the above directions are very plain, and the whole management of the machine so very easy, that with little care one is sure to succeed. But in case a difficulty is encountered, the following caution must be attended to. The electric fluid is always collected by a point; that is the reason that a row of points is along the conductor towards the cylinder--to collect the fluid from the cylinder. *Any point, therefore,*

which is near the cylinder draws the fluid away from it. To a small degree other shaped bodies draw off the fluid, so does flame, therefore care is required when the machine is in use that nothing stands near it—no candle, no pin, nor needle, no finger pointed at it, no noses, no sticks, no elbows. Take care also that there is no dust upon the machine and no filaments of threads, for every particle is a point drawing away the fluid. And above all things, see that the cylinder and conductor leg are *perfectly dry;* therefore, do not breathe upon them, and for so small a machine it would work the better if it were warmed every quarter of an hour or so. If the handle turn very easily, tighten the cushion, for it should be so tight that there is a good pressure between the cushion and cylinder, and yet not so much as to cause any part of it being broken. If on turning back the flap, the cylinder looks very greasy and black with worn amalgam, it is because there is too much tallow; it must be wiped clean, which may be done without disturbing any part of the machine, by holding a silk handkerchief against the cylinder when being turned round. If the handle turn stiffer after a few turns than it did at first, it shows that the machine is in good working order; if it turn too stiff, however, warm the flap and wipe the cylinder; if this will not do, loosen the cushion. When the machine ceases to act, certain it is that some dust or damp is clinging to it, perhaps a hair. These cautions being observed, success is certain. I may mention that the same preparation of the machine is required every time it is used, except that much less tallow and amalgam are wanted after the first application of it, as what is on before need not be removed, unless it has got very old and hard. In larger machines than the one described, a chain is usually hung from the cushion to the table, as the fluid is more easily collected from the ground. This addition to a small machine would do no harm; on the contrary, it might work the better for it. When the machine is laid aside, always loosen the cushion.

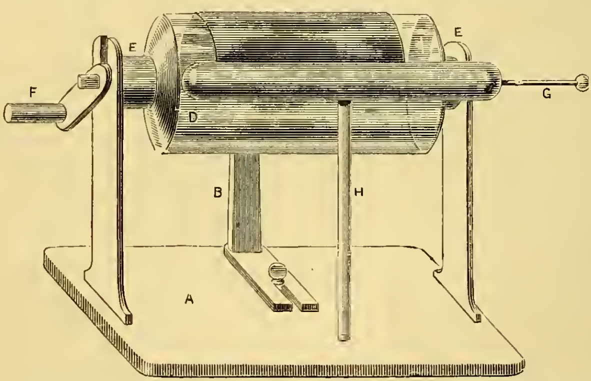


FIG. 10.—MACHINE COMPLETE.—A, Stand; B, Upright of Cushion; C, Silk flap of Cushion; D, Cylinder; E, E, Caps; F, Handle; G, Prime Conductor; H, Glass Rod supporting Conductor.

The machine is now quite complete, and will collect and produce electricity, but now comes the question of storing it—that is to say, of collecting a sufficient quantity for producing striking effects. For this purpose a Leyden jar is necessary. These of course can be bought, with polished mahogany tops, brass rods, and balls complete, at the following prices:

Capacity .	½	1	1½	2	3	4 pints
Price . .	2/6	3/6	4/6	5/6	7/-	9/6 each;

but it may not be convenient for some who will interest themselves in making an electrical machine to lay out five or six shillings in purchasing one, and this would be necessary to obtain one of the size I would recommend, viz., 2 pints. I will therefore describe how one may be made for certainly not more than 2s.

Procure a glass jar (Fig. 11), say about 4 or 5 inches in diameter and of 2 pints' capacity, being careful to see that there are no flaws nor cracks in it, as it would then be no good whatever. Next cut a piece of tinfoil the width of about three parts the height of the jar and rather longer than to go round it *inside.* Decide which is to be the bottom, and then cut little notches all along the length of it. This tinfoil is to be pasted with ordinary paste *inside* the jar, the notched part being arranged very neatly and evenly at the bottom. Now cut a disc, also in tinfoil, the size of the jar, or perhaps rather less, paste it, and fix it to the bottom of the jar *inside.* See that this, as well as that which has been pasted on the sides, is all perfectly even—no rough edges nor ridges. Now cut another piece of tinfoil, rather longer than to go round the jar *outside,* and in width, to be when pasted on the jar about a quarter of an inch above the tinfoil inside. Notch again the bottom side, paste it carefully and evenly on the *outside* of the jar, and turn the notched part nicely under the bottle. Lastly, cut another disc rather smaller than the bottom of the jar, and paste that on. Now get a brass ball (Fig. 12) such as you had for the

[illegible]

XVII

PRESENTED WITH PART XVII. OF

AMATEUR WORK, ILLUSTRATED.

VIOLIN-MAKING AS IT WAS AND IS.—MOULD AND OUTLINES OF STRADIVARI VIOLIN.

1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, Models for the Arching of Back and Belly; H, I, J, K, L, M, Cramping Blocks belonging to Mould.

WARD, LOCK & CO. WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

prime conductor, and fix it to a brass rod about six ins. long, at the other end of which drill a hole and insert the end link of a brass chain about nine inches long. Next cut a disc of ½ inch wood, exactly the size to fit pretty tightly inside the top of the jar, and then cut another, one inch larger in diameter, smooth the edges well, and glue one on the top of the other (Fig. 13). When it is done it will have the appearance of a kind of stopper for the jar. When the glue has thoroughly dried, bore a hole in the middle of the stopper of the exact size of the brass rod, which latter is to be inserted in the former (Fig. 14). Put the wooden stopper of cap on the jar, letting the chain go into the jar and rest on the bottom, and leaving the brass ball outside (Fig. 15). The illustrations given in Figs. 11—15 will clearly explain the foregoing instructions.

The next thing is to make it work, or to charge it. To do this, be very careful to warm it, and let the uncovered part of the glass above the tinfoil be wiped clean, and perfectly *dry*. Then, having the machine in perfect order, bring the Leyden jar to it, and let the brass ball rest against, or be very near to, the ball of the conductor, turn the handle (in an outward direction, of course, having the handle of the right hand), and sparks will pass from the conductor to the jar, which will be seen when the jar is held a little way off.

When, say, you have turned the handle ten times, remove the jar from the machine by catching hold of it as near the bottom as possible on the tinfoil. Remain holding it, touch the brass ball with the knuckle of the other hand, and you will, the instant you do this, receive a shock which will pass through your two arms. I dare say, with only ten turns of the machine, the shock will not be disagreeable; next time give fifteen turns, and then twenty, and so on, and you will soon get to know what strength of shocks so many turns will give. You may give a dozen people a shock all at one time; let them join hands, and let the person at one of the ends take hold of the outside coating of the jar, and the person at the other end touch the ball quickly with the knuckle. I say quickly; for if it is done slowly, it will draw off the fluid without producing any effect. I may mention that all will feel the shock equally; the ones touching the jar will feel no more than those in the middle of the circle. To pass the shock through twelve persons I would try forty times to begin with.

Perhaps some of my readers would rather not receive a shock, and yet would be equally desirous of seeing the effect; this they can do by using what is termed a discharging-rod. It consists simply of a piece of stout brass wire, bent as shown in Fig. 16, and having a brass ball fixed at each end :—

When the jar is charged with the fluid, hold it with the left hand as near the bottom as possible, and take the discharging-rod in the other; keep one ball of the said rod touching the outer coating of the jar, and let the other ball of the rod touch the ball of the jar, and immediately before the two balls touch, the fluid will pass in the form of a spark. This operation will be readily understood by the foregoing engraving. At H will be seen the position of the rod before discharging, and at I the position when in the act of being discharged; G is the spark passing from the jar to the rod. In this way the jar can be discharged without anyone feeling the effect of the shock.

In conclusion, I will repeat my cautions, which must be rigidly attended to in order to insure success. First, let the machine and jar be quite free from dust, hairs, etc.; secondly, let them be thoroughly warmed before the fire before using, so as to get rid of any moisture that may be on either, though, perhaps, invisible to the eye. And in wishing success to every one who may attempt to construct an electrical machine from the foregoing instructions, I may mention for their own satisfaction that a shock from a machine of the size described will never injure anyone if passed through the arms; but, at the same time, would advise them to be careful not to experimentalize on persons of weak hearts or of delicate constitutions.

THE VIOLIN: HOW TO MAKE IT.

By EDWARD HERON-ALLEN.

(*For Illustrations, see the Supplement to this Part.*)

II.—THE MOULD AND ITS ACCESSORIES.

"Quante han voci la terra e il cielo e l'onda
Quanti accenti il dolor, la gioia, e l'ira
Tutto un concavo legno in grembo accoglie."
FELICE ROMANI.

THE first thing to be done is to decide upon the model of your instrument, and make your mould. Moulds are of two sorts—"the inside mould," which is solid, and *round* which the fiddle is made; and "the outside mould," which is cut out like a frame, and *inside* which the fiddle is made. Of the former I shall speak later on; at present we are going to make *this* fiddle on the latter or outside mould. The first step is to decide upon your model and outline, if you wish to copy any given master, or if you wish to produce your own original model, you will find directions for this in Vol. I., page 208. (I may say that unless you wish particularly to copy any particular fiddle, you cannot do better than adopt the model, outline, mould, etc., given in the plate accompanying this chapter, which is that of a Stradiuarius of the most finished elegance.) The first thing is to take an

outline, as exact as possible, of the fiddle to be copied, then transfer this to a sheet of wood $\frac{1}{16}$ inch thick, rather larger than the outline. Then with the *finest* fret or bow-saw cut this out *as evenly as you possibly can*, sparing no pains to keep your cutting free from all irregularities. Mark on the fiddle-shaped piece thus cut out, and the frame from which you have cut it, the exact centre of the outline, drawing a line down the centre, as at A B in the plate. Having ascertained that your outline is correct, take a piece of hard wood, the size and shape of the mould figured in the plate, $1\frac{3}{4}$ inches thick, and mark the exact centre of it by drawing from top to bottom the line A B. Take your plank outline, down which a line is drawn, and place it on the plank which is to form the mould so that the line down the centre of your outline coincides exactly with the line A B down the centre of the mould. Holding the outline very firmly in this position so that the centre cannot move at either end from the line A B (if necessary, fixing it thus with cramps), draw with a fine point the *exact* outline of your plank on the board, and make it indelible by scratching it into the surface of the wood. You will then have the outline C, C, C drawn on your mould. To measure the breadth from the extreme edge to the sides, allowing for wear, and guided by the eye, draw a line right round inside the line C, preserving the same distance between them throughout, you will then have traced on the plank the line D, D, D. Then cut out very gradually, and with the same amount of care as you devoted to cutting your outline, all the wood inside the line D, left white in the plate. Your mould is now cut out, having a thickness all over of $1\frac{3}{4}$ inches. But we have seen (p. 206, Vol. I.) that the sides of a fiddle are shallower in the upper than in the lower bouts, and in the case in point, from which we are now working, the deviation was from $1\frac{5}{16}$ in the lower bouts to $1\frac{1}{4}$ in the upper; your mould must therefore have the same deviation, which is arrived at by turning it over (so as not to plane away the lines C and A B) and planing round it very carefully, constantly measuring the depths till the gradual decrease in diameter is obtained. You have now got a hollow mould of the proper thickness, on the top of which are drawn with perfect symmetry the lines A B and C, a thin plank outline exactly corresponding with the line C, down the exact centre of which runs a line corresponding with the line A B on the mould. On this last plank outline proceed to mark in their exact positions in the original fiddle the position of the sound-post E, and the *ff* holes F. You may, if you like, add the purfling, which is represented in the illustration by the line D, or boundary of the mould. Before we go further, it may be well to explain fully the nature of this illustration. For purposes of working it may be as well to take four tracings of it, so as to separate the various things it illustrates. All the shaded part represents a violin mould, round the cutting of which is traced the actual outline of the fiddle from which it has been made. Make tracing number one, of all the shaded parts, including the line C C, and showing at top and bottom the ends of the centre line A B. Then make tracing No. 2 of the outline C, C, C as exactly as possible, bearing the line A B down its centre, the sound-post E, and the *ff* hole F. Glue this tracing to a leaf of wood, sufficiently large, and cut it out most carefully, as it is your plank outline to which I have referred before. Cut out the sound-post E, and the *f* hole F; this latter must be carefully reproduced on the opposite side of the line A B to form the other *f* hole. It will be noticed that at the bottom of the mould (or shaded part) the words "back" and "belly" are printed, this means that to save room, and as both sides of a back and belly are identical, I have made the right-hand half represent the belly, and the left-hand half the back. If you turn to page 209, Vol. I., you will find that the curved lines on these two halves correspond with those on Figs. 30 and 31 on that page, which bears two small outlines, showing these same markings. By the aid of these (Figs. 30 and 31) make two tracings of the outline C, C, C bearing the curved dotted lines, one of them being a full-size enlargement of Fig 30, bearing the thicknesses of the back, and on the other, reproducing similarly the thicknesses of the belly, as in Fig. 31. Draw right across the traced outline of the back the lines 1, 2, 3, 4, 5 (which traverse the left-hand or back-half of the outline C, C, C). Draw across the traced outline of the belly the lines 9, 10, 11, 12 (which traverse the right-hand or belly-half of the outline C, C, C); and also draw on the belly outline, the line 7, which runs from top to top of the *ff* holes, and the line 8, which runs from bottom to bottom of the *ff* holes. You have, therefore, now a tracing from which to make your mould, a tracing of the outline C, C, C with *ff* holes and sound-post from which to make your plank outline, and two tracings, showing respectively the outlines and thicknesses of the back and belly, instead of the confused mass of lines, etc., which are found in the drawing of the mould. Next, make of thin hard wood the eleven "guides," figured actual size. These are respectively, 1, 2, 3, 4, and 5, the model or elevation of the arching of the back, taken from the edge to the join (A B, mould), along the lines 1, 2, 3, 4, and 5 respectively; 7 and 8 show the arching of the belly and back between the centre bouts or C's, along the lines 7 and 8; and 9, 10, 11, and 12 show the arching of the belly, taken along the lines 9, 10, 11, and 12. A similar guide to the entire arching, along

the line A B is made by cutting a similar piece of wood to the curve of the line C, C, C on the plate. It will be observed that the guide No. 8 is merely a doubled form of No. 3, and shows the arching of the centre of the back.

The last accessories of the mould are the cramping-blocks, which are represented in their actual size at H, I, J, K, L, M. These are pieces of wood cut the same depth as the mould, to fit its curves at the points H, I, J, K, L, and M respectively, marked on the shaded part of the mould. The outer edges, or those which touch the sides, are lined with a thin sheet of cork, represented in the figures of the cramping blocks by the shading. These pieces are used to cramp the sides into their final shape, in manner hereinafter appearing.

So much for the construction and accessories of what is called "the outside mould." The other form, or "inside mould," will be described in another place, and I hope to give instructions for making a fiddle of the Guarnerius pattern, on an inside mould, and otherwise differing in many particulars from the fiddle we are now going to construct. Outlines and models for the neck and scroll, and other parts of our present fiddle, and taken from the same instrument that has served us as a pattern for this mould will be duly given in their proper places. When I have finished it, I hope to present to our readers another set of models, this time of a Guarnerius fiddle, as complete in themselves as those already (and to be) given, accompanied by instructions as to processes differing materially from our present scheme. Having, therefore, prepared our mould and arching models, let us set to work to build our fiddle, and remember—*Prius quam incipias consulto, et ubi consuleris, mature facto opus est.*

(*To be continued.*)

DECORATIVE CARPENTRY.

FOR THE ARTISTIC AND USEFUL ADORNMENT OF THE INTERIOR OF EVERY HOME.

By J. W. GLEESON-WHITE.

II.—MINOR FITTINGS FOR THE HALL.

BEFORE entering on the subject which I have chosen for this chapter, and which forms a fitting continuation to that which precedes it, I think it desirable to make a few additional remarks on the illustration of a combined hat-rack, umbrella-stand, and hall table that was given in Fig. 5. This design is intended rather as a suggestion to be altered and adapted as needed, than as a working drawing. Wood ½ inch to ¾ inch thick, and 2 inches wide forms the framework in every part; the sizes of the squares must be regulated by the tile chosen to fill them, a 4-inch tile being used for the dado. The strand itself would be 42 inches in width, and the height of table governed by the height of the wainscot, the middle is left open to receive sticks and umbrellas, the side portions acting as a hall table, a mirror occupies the centre panel at the back, and hooks for hats are placed at convenient places; this is distinctly for hats of callers, not for the hat-rack of the house, which should not (I think) be placed in full view near the front door. If desired, drawers could be fitted underneath the table parts, and the lower part on either side enclosed by small doors to hold skates or other items not in daily request. The panels at the sides of the upright back consist of a square of wood carrying a tile, or simply framed with square opening as shown in drawing, or with shields with armorial bearings, heraldic emblems, etc. A shelf is placed over the looking-glass, or this shelf may be arranged to carry a clock, in this case it would be better immediately above the mirror. The whole piece of wood-work should be, of course, painted, or of the same material as the wainscoting of the passage.

In order of importance it would be best, perhaps, that the various treatments of the door, with and without over-doors and other accessories, should come here; but as so much that might be said about them will apply equally to any other part of the house, I think it best to postpone the door, and give a chapter solely devoted to that feature in a succeeding number of AMATEUR WORK, and content myself in this article with pointing out other available fittings for the hall and the adjacent passage-ways.

In the hall itself there is often an odd corner, as the angle between two doorways (or a door opening, and a plain wall) that would allow of the addition of a corner-cupboard sufficiently out of the way to be no impediment to passers-by, but yet very handy and useful to keep the various waifs and strays of a household that are doomed to an uncertain resting-place in the hall, such as skates, tennis-bats, and the various accessories required for football, cricket, and other sports, garden-tools and gloves, and similar things that miss the presence of the old cupboards once so plentiful in every house, but now, as fixtures, almost overlooked. Such a cupboard might be made in form similar to Figs. 12 or 13. The carpentry is so simple, and merely of the same class as the fittings already described, that working drawings would be hardly necessary, the more so as in this case the space to be filled must govern the size and form of the cupboard or shelf. But in any case the intention is that it shall be a fixture, made of the same wood as the wainscot or dado, and with decoration, if any, in har-

mony with the rest of the work, so finished, that the whole shall retire into its proper place as part of the woodwork of the building, and not lay any claim to the higher finish regarded, perhaps rightly, as belonging to a piece of furniture.

In the design, Fig. 12, the level of the dado is kept, and also that of the skirting-board, while the principal lines govern also the place of the shelves, except that the cupboard, for utility's sake, encloses a larger space than the small panels of the dado, but is made with doors having panels the size of the upper row in the wainscot, but four to each door (if space allows of two doors), or one door of four panels if it is necessary to economize the room. The lower shelf is kept just above the level of the skirting, which still shows for the sides of the recess below the cupboard. The top shelf of cupboard is on the same level as the chair-rail; but another rail is added, or, rather, replaces the first one, to form a finish to the shelf, and prevent the soiling of the wall, that, from the frequent dusting of the shelf, would leave a mark on the paper if it were not so protected.

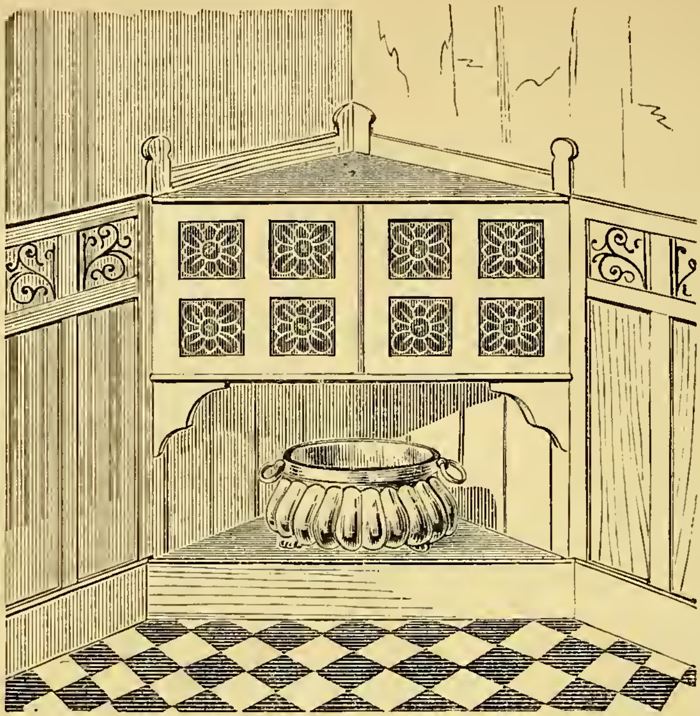


FIG. 12.—CORNER CUPBOARD AND SHELF FOR HALL.

In Fig. 13 another form of corner-cupboard is given, with the tiles of the wainscot arranged to form a background on the main shelf, and carrying also a smaller one above; while the cupboard is formed below, and treated independently of the dado, with plain wood lining the walls, as indicated in the sketch. The shelves may be kept for use, and afford a rest for trays, etc., while the doors are being opened, or serve to hold a large pot or statue, and add to the decoration of the dwelling.

FIG. 15—SIMPLE SCREEN OF WOOD WITH GLASS OR CURTAINS.

In Fig. 14 a very simple shelf is shown, hardly worth naming, but grouping well with the style of wainscot given in Fig. 1

(in the December part). It will be seen that the wainscot itself is heightened in the space proposed to be used as a shelf, with the addition of simple brackets to the uprights to give the idea of support to the shelf, which should also fit into

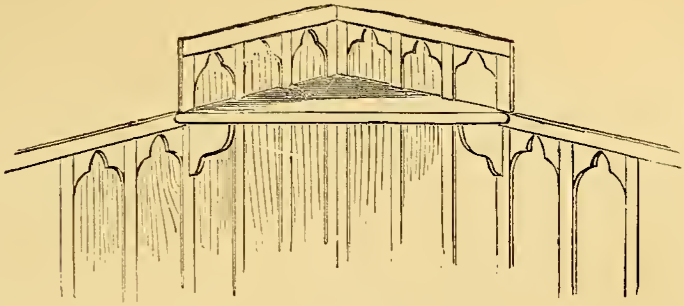


FIG. 14.—SIMPLE SHELF IN CORNER OF HALL.

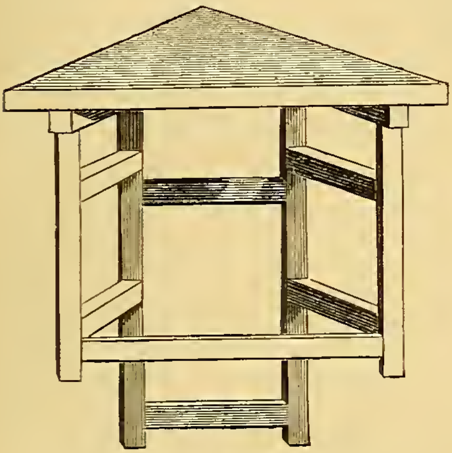


FIG. 16.—TRIANGULAR SKELETON BRACKET OF PAINTED WOOD FOR CORNER OF HALL.

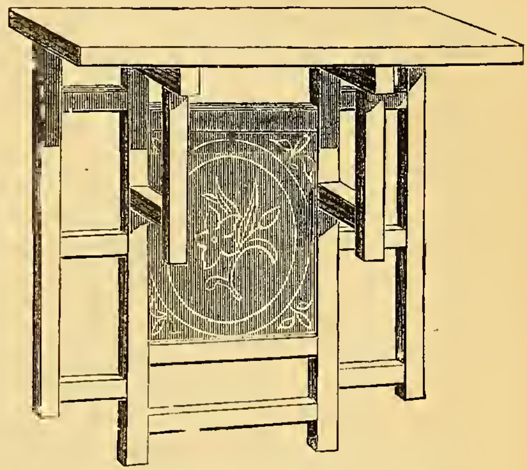


FIG. 17.—SQUARE SKELETON BRACKET FOR HALL, WITH TILE IN CENTRAL OPENING.

the rail of the dado to give it stability.

If the hall, from its size and ground-plan, will admit its introduction, I know of no more easily erected and decorative feature than a simple screen of wood-work, either with or without curtains. By cutting up the space, it really gives the impression of more room. The art effect of suggesting a further portion of the building not fully visible, was so common in our older houses and churches (apart from its ritual use), and is of such evident value, that all who have seen the same interior with and without this feature will allow that it is worthy of any amount of praise; hardly any other structure of so trifling cost and trouble could give so much character to the house, and be in itself not merely a decoration, but a useful addition, as, if draped with curtains, it takes the place of an inner door in maintaining the temperature of the dwelling, and increasing privacy, while free from the space taken up by a door, and saving the noise and trouble of its frequent opening and

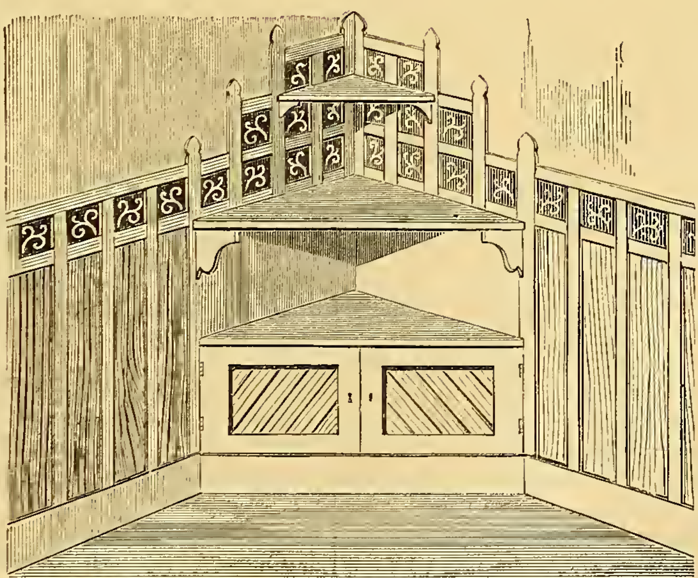


FIG. 13.—CORNER CUPBOARD AND SHELVES FOR HALL.

shutting, while in warm weather it is a pleasing decoration. In one house I know, a small hall has been treated with a screen, similar to that shown in Fig. 15, with the greatest success. Such a screen might be made of inch or inch and a half deal, or other wood, simply framed in the ordinary way, the lower portion continuing the wainscot, while the upper portion may be either open, with hangings, as shown, or glazed with coloured glass by means of the "Glacier" Decoration or other glass covering. The top rail should fit to the ceiling; when screwed to the joist, it will be easily fixed; while, if height permit it, a second rail, about twelve or fifteen inches below, crosses the whole as shown. A shelf might be added, held at either side, and with gay pottery or screen would help furnish the hall, or might run right across the opening itself, as well, if plenty of bric-a-brac is available to place on it.

A simple form of bracket of painted wood, in keeping with the other work, is shown in Figs. 16 and 17 (made to take an old Dutch or Minton tile) of skeleton woodwork, all square rods about three-quarter inch section, and pegged or nailed together. I have made them for a hall, and found them very effective, and somewhat uncommon. If the top is screwed through, it will be found quite strong enough to take a bust or clock; and from the fact of its being painted like the whole woodwork, is less spotty in its effect on the whole than a carved Swiss wood or polished oak bracket.

In any method of treatment of the screen—and this applies no less to all the other fittings of the hall—an absence of fussiness and over-done variety should be carefully insisted on, as the more all the woodwork is kept of the same colour, varnished or painted, as it may be, while the decoration, if papyrotile, hand-painting, or whatever it be, should be, in one apartment, of the same class throughout. While one or two points of good decoration give a pleasant impression, a greater quantity of cheap ornament slavishly applied everywhere destroys the whole effect, and creates a restlessness of decoration (so-called) the reverse of pleasant. At the same time, if a greater amount of money or labour is available, it is by no means intended to replace it by the simple substitutes here given. If the screen can be of oak, with round pillars and well-carved capitals, with the panels below, well moulded or carved, and the rest of the structural woodwork throughout the hall of solid wood, well finished, a much more elaborate type of ornament would be in keeping; but the purpose of these papers was, from the first, intended to be less good art or fashionable art than inexpensive woodwork of the simplest character, that is within the scope of the mildest form of amateur carpentry, assisted, perhaps, by an ordinary "jobbing" man for the more mechanical parts. I intend, I may say, to devote a future chapter to mantels and over-mantels, so that this possible feature of the hall, but, if wanted, a very important one, may be fully treated later on.

(*To be continued.*)

ORGAN BUILDING FOR AMATEURS.

By MARK WICKS. from 22 b

CHAPTER V.—THE BUILDING FRAME AND MANUAL ACTION.

BY the building frame is meant the frame work which supports the sound-board and pipes, the key-board, bellows, etc., and as these portions of the instrument are of great weight, it is very necessary that the building frame should be well and substantially constructed. A glance at Fig. 55 will show that no great ingenuity is required in the construction of this framework, as it consists merely of two posts and two cross rails at each end, joined together by two longitudinal rails or bars, on which rest two boards. The exact position of these bars and rails is a matter of considerable importance, and will vary according to the style of the instrument. The building-frame shown in the sketch is for the organ described in Scheme 1, on page 21, of Part XII., but the general method of construction will be the same for all the schemes I have mentioned, the only alterations being in the dimensions.

First prepare the four upright posts of yellow deal or pine, 4 feet 3 inches long, $3\frac{1}{2}$ inches, or more, wide, and not less than $1\frac{1}{2}$ inch thick. If wood or metal pipes are largely used, the posts should be 2 inches thick at least. The cross rails are the same thickness as the posts, and 6 inches deep, and should be tenoned right through the posts, so that, when finished, the outside width of the frames measure 2 feet 2 inches, thus being a little wider than the sound-board. The top rails are placed so that the top edges of them are just level with the top of the posts. The top edges of the lower rails should be just 14 inches from the ground. On the inside of these lower rails another rail, exactly the same size, and $1\frac{1}{4}$ inch thick, should be strongly glued and screwed. On these inner rails the ends of the middle board of the bellows will rest; and if there are no wind-trunks at the ends of the bellows, a similar rail 3 or 4 inches wide may be screwed at a distance above the others, equal to the thickness of the bellows board, thus forming a groove into which that board will just slide without allowing any upward play. But if there should be a wind-trunk at either end, this upper rail must be omitted, as it would come in the way of such wind-trunk.

Having made the two end framings exactly similar in every respect, they must now be joined together by the two longitudinal rails which should each be 5 feet long, $4\frac{1}{2}$ inches wide, and $1\frac{1}{4}$ inch thick. The back rail is tenoned into the back posts so that the top edge of it is 2 feet 8 inches from the ground; the front one is tenoned into the front posts so that its top edge is 2 feet 3 inches from the ground. The distance between the end frames should be 4 feet 9 inches, so that it just allows the middle board of the bellows to slide in between them and rest on the rails screwed on to support it. Now get out two pieces of deal 5 inches wide, 1 foot $1\frac{1}{4}$ inch long and $1\frac{1}{4}$ thick, and glue them edgewise on to the top of the front rail at each end, thus making the rail exactly the same height as the top of the back rail, and leaving an open space in the centre 2 feet $6\frac{1}{2}$ inches wide. Now prepare two boards of $\frac{3}{4}$ inch pine, 1 foot $1\frac{1}{4}$ inch wide and about 3 feet 3 inches long, and screw them down on to the front and back rails so that the front edges overhang. On these boards the sides, or cheeks of the key-board will rest, and the keys themselves will have a clear space under them for the necessary action to be placed in connection with the pedals. The ends of these two boards should be left square until the case of the instrument is decided upon, when they may be cut off to any shape or size that may required, or as suggested in the sketch by the dotted lines.

The sound-board will rest on the top of the posts and cross rails, and all that will be required to keep it in its place will be two little dowells, or pegs of hard wood, at each end as shown at D in Fig. 55. These dowells fit into holes in the underside of the wind-chest and cheeks of the sound-board, and the weight of it, especially when loaded with pipes, will keep it down firmly.

If no pedals are to be added to the instrument the posts of the building frame are to be 3 inches shorter so that the lower rails will only be 11 inches instead of 14 inches from the ground.

Fig. 56 shows the building frame complete with the sound-board, key-board, bellows, etc., in position. The middle board of the bellows must be secured to the rails by screws or buttons, as the case may require.

Two coats of paint would make the frame look all the nicer and preserve it from damage by damp, etc.

We must now consider what alterations would be necessary in order to make a building frame suitable for any of the other schemes which I have described. For either of the two-manual organs the only difference will be that it must be made 2 inches wider than the total width of the two sound-boards, and about four inches extra height allowed for the posts above the level of the boards supporting the key-board if octave couplers are to be used.

If no octave couplers are to be placed in any of these organs, either single or two-manual, 9 or 10 inches will be sufficient for the height of the underside of the wind-chest above the top of the key-board; but if couplers are to be used, the height must not be less than 15 inches, and for a two-manual this height must be measured above the upper key-board.

In order to make these matters quite clear, I now give a summary of the chief points to be attended to in constructing a building frame for any small organ:

1. The outside measurement of it should be the same length as the sound-board, and slightly wider.

2. The top of the key-board should be 28 inches from the floor or above the pedals, if any, and the under-side of it would thus be about 25 inches from either of these points.

3. The middle board of the bellows should rest on rails not less than 11 inches above the floor, or above the pedal action, if any.

4. The key-board should project about 10 inches from the front of the under case or panelling, and the length of the projection of the boards supporting the key-board will depend on the existence or non-existence of a swell-box.

5. If an octave coupler is required, the height of the under-side of the wind-chest above the keyboard should be 15 inches at least; but if there is no octave coupler, 9 or 10 inches will be sufficient. *Note.*—This height may be reduced in extreme cases, where the height of the room really demands it, but it renders it difficult to get at the action.

6. In a two-manual this height should be taken from the top of the upper key-board.

Where, however, the room is very low, or, for some other reason, it is required to keep down the height of the instrument as much as possible, the action can be made to pass below the level of the key-board, as shown in Fig. 60. The key-board may in this case be two or three inches higher from the ground. The building frame would be very low, and thus effect a considerable saving.

Where pipes are planted off, they may be supported on a board placed on brackets screwed to the end posts.

We must now direct our attention to the manual action, which is the mechanism by which, when a key is depressed, the valve or pallet in the wind-chest belonging to that note is opened, and all the pipes over that channel, for which stops are drawn, caused to sound. Many are the ways in which this is accomplished, but we need only concern ourselves with two of them, namely, the fan-frame action, pure and simple, and the fan-frame modified by the introduction of a few rollers.

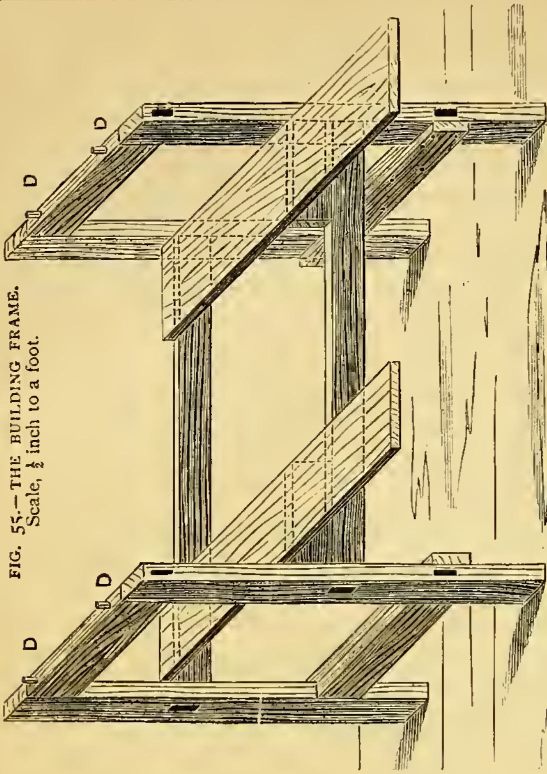


FIG. 55.—THE BUILDING FRAME.
Scale, ½ inch to a foot.

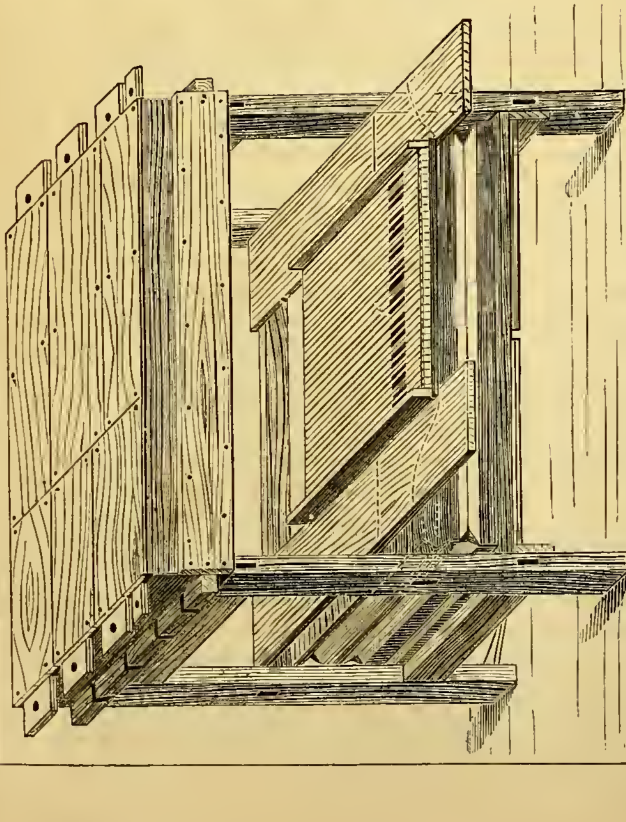


FIG. 56.—BUILDING FRAME, WITH BELLOWS, SOUND-BOARD, ETC., IN POSITION.
Scale ½ inch to a foot.

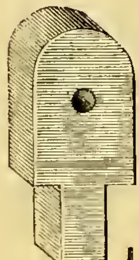


FIG. 66.—ROLLER STUD.

FIG. 64.—ENLARGED VIEW OF ROLLER.

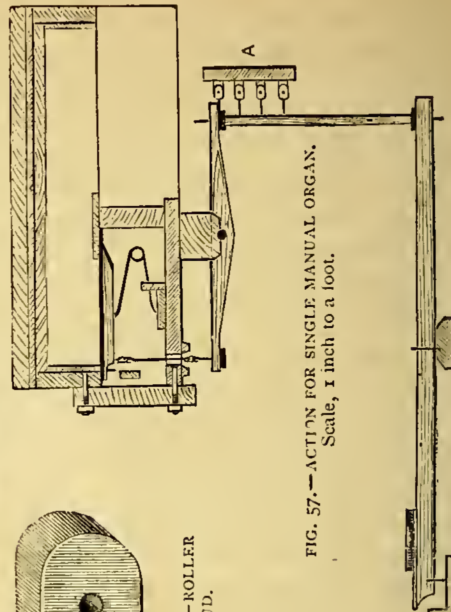


FIG. 57.—ACTION FOR SINGLE MANUAL ORGAN.
Scale, 1 inch to a foot.

FIG. 63.—END VIEW OF ROLLER BOARD.

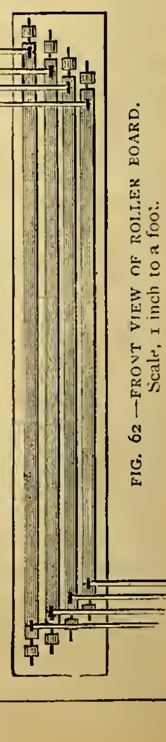


FIG. 62.—FRONT VIEW OF ROLLER BOARD.
Scale, 1 inch to a foot.

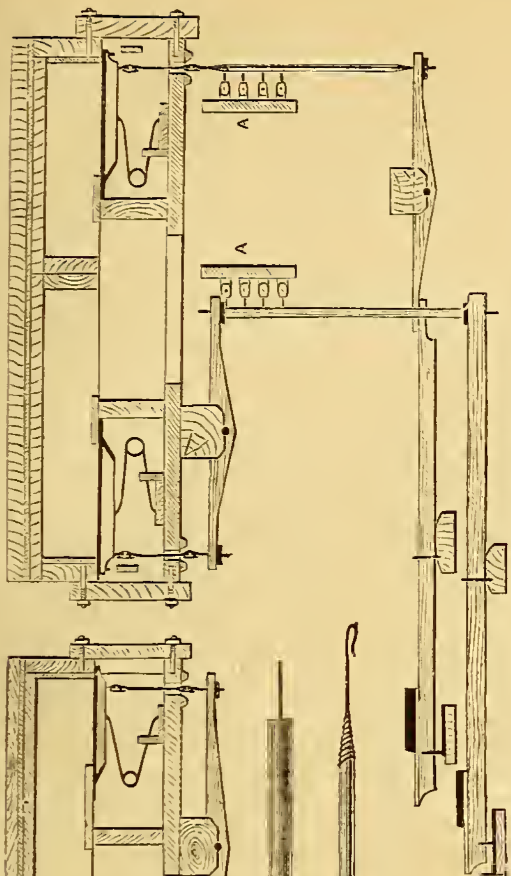


FIG 58.—ACTION FOR TWO-MANUAL ORGAN. Scale, 1 inch to a foot.

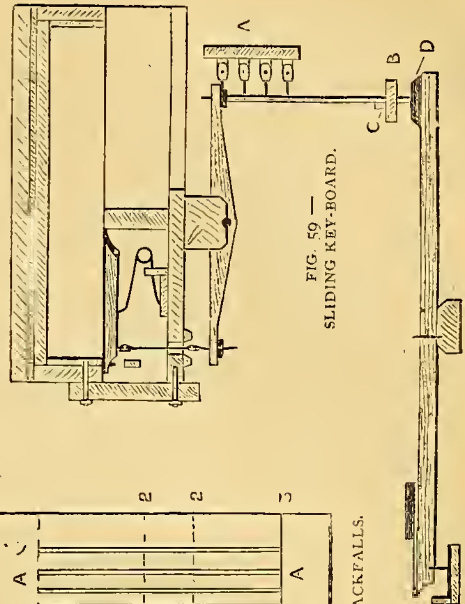


FIG. 59.—SLIDING KEY-BOARD.

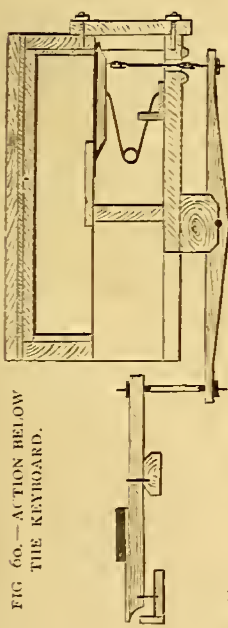


FIG 60.—ACTION BELOW THE KEYBOARD.

FIG. 67.—STICKER.

FIG. 68.—TRACKER.

FIG. 69.—TOP OF TRACKER AND TAPPED WIRE.

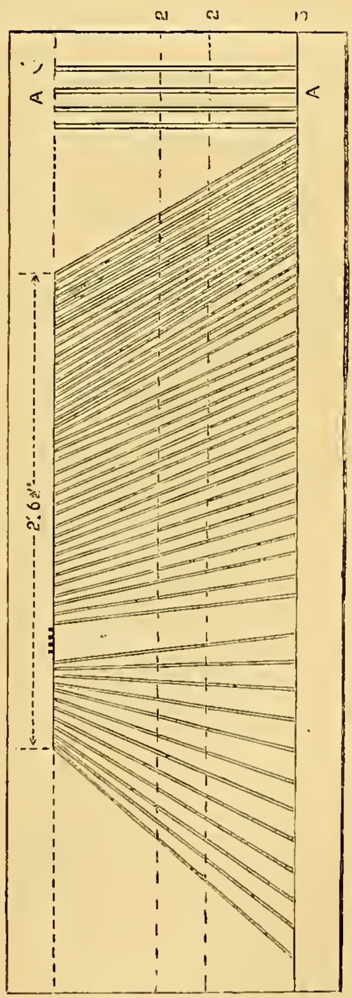


FIG. 61.—PLAN OF BACKFALLS.

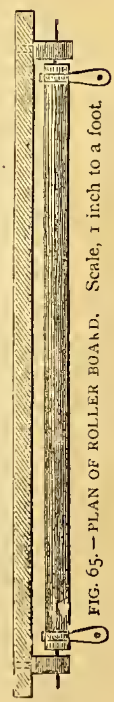


FIG. 65.—PLAN OF ROLLER BOARD. Scale, 1 inch to a foot.

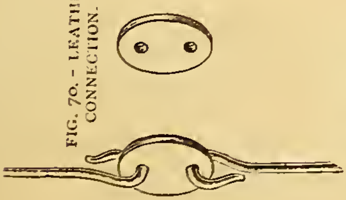


FIG. 70.—LEATHER CONNECTION.

FIG 71.—PULL-DOWNS HOOKED INTO LEATHER CONNECTION.

Fig. 57 shows a side view of both these actions, the roller board being marked A. It will be seen that on the end of the key-tail is an upright rod of thin wood, termed a sticker, with a wire in each end of it, the lower wire passing through the key-tail and the upper one passing through the end of a thin piece of wood termed a backfall. This backfall works on a centre wire, and in a groove cut in a square balk of wood termed a backfall rail, or bridge, and the other end of it is connected by a tapped wire with the pull-down of the pallet. Thus, when the front of the key is pressed down, the tail of it is raised, and with it the sticker and the back end of the backfall. The front end of the backfall consequently descends, and brings with it the tapped wire and the pulldown, and thus opens the pallet. When the pressure on the key is taken off, the action returns to its original position. A set of these is required for every note on the key-board, and, as the back ends of the backfalls are immediately over the key-tails, and the front ends are immediately under their respective valves, it follows that, as the sound-board is longer than the key-board, the backfalls spread out in the form of a fan, thus giving rise to the term fan-frame action. A plan showing the radiation of the backfalls is given in Fig. 60. The action of the roller will be better understood if described later on.

First make the stickers, which may be either square or round. If square they may be cut off a plank of good sound pine $\frac{3}{8}$ inch thick, either with a saw or a cutting gauge, and finished off with glass-paper, so that they are rather less than $\frac{3}{8}$ inch square. They may be made in long pieces and cut up to the required lengths afterwards. If round stickers are required, take a $\frac{3}{8}$ inch bead plane and run a bead all along one edge of the $\frac{3}{8}$ inch plank, turn the board over and run a bead along the other edge of the same side, as the two quirks will nearly meet the bead will easily crack off, and present the form of a round stick, which will only require finishing off with glass paper to make it present a neat appearance.

When the stickers are cut to the required length insert a piece of tolerably stout tinned iron, or phosphor bronze, wire in each end, allowing it to project $1\frac{1}{2}$ inches. See Fig. 67.

The backfall rail should be next got out, it should be nearly as long as the sound-board, and about $2\frac{1}{2}$ or 3 inches square. It may be made of oak, mahogany or pine, but whatever material is used should be sound and dry. The backfalls themselves should be $1\frac{1}{2}$ inches wide and rather over $\frac{1}{4}$ inch thick, mahogany being the best material to use for them.

They should be cut to the shape shown in the sketches, and the lengths will depend on the lengths of the keys and the extent of the radiation. In order to find the lengths of the backfalls and the exact position of the grooves in the backfall rail in which they are to work you must now proceed to set out to full size the plan indicated in Fig. 61. Take a piece of smooth board just long enough to slide in between the posts of the building frame, and wide enough to extend back an inch or two beyond the key tails, while the front edge is an inch or two in front of the line of the pulldowns of the pallets.

Now draw on it the line marked 1 1, immediately over the holes for the sticker wires in the key-tails, and mark on this line the exact position of every such hole, which is really in the centre line of each key. Keeping the board carefully in the same position draw the line 3 3 exactly under the line of the pulldown wires, and mark on it the position of every pulldown. These positions may be marked off on a rod and then transferred to the line on the board. Now join the points on the back line to the points on the front line, and this will give you the exact length of every backfall from the hole where the sticker wire goes through to the hole where the pulldown wire passes through, so you may cut them all about an inch longer. In joining these points do not forget that if the four tenor channels are transferred to the treble end of the sound-board, you pass over the 13th, 14th, 15th, and 16th points over the key-tail line and join the 17th point to the 13th point on the pulldown line, and so on, as the backfalls for the transferred channels are immediately under those channels and run square across the board, as shown at A A on the plan, Fig. 61. Now take the backfall rail and make a deep gauge mark all along the centre line of it, and make this mark correspond with the centre line of the backfalls as marked on the board. Lay the backfall rail in this position—with the gauge mark downwards—on the board, as shown by the two lines on the plan marked 2 2, and mark on both sides of it the position of the backfall lines take the rail up and join these points, and you will then have the centre line of every groove for the backfalls to work in. With a fine tenon saw carefully saw down the grooves to a depth of $1\frac{1}{4}$ inch, allowing them to be just wide enough for the backfalls to work freely in them; take out the intervening wood with a $\frac{1}{4}$ inch chisel, and smooth the sides of the grooves with a flat file or a piece of glass-paper placed over a thin flat piece of wood.

The backfalls are inserted in their proper position, a stout wire run through the centres, and fastened down in the gauge mark on the backfall rail by means of narrow pieces of thin hard wood, or sheet brass being screwed over it with small screws. This plan is better than using staples, which are apt to split the rail, and cannot easily be withdrawn if required.

The centre wire should only run through those

backfalls which run in a tolerably direct line across tbe rail, but, where they radiate much, a separate centre wire sbould be used for each one, and fastened down as before described, as it does not do to let the axis pass obliquely through the backfalls.

The holes in the backfalls should all be made with a drill. and tbe centre ones must be bushed ; that is, lined with cloth, in order to secure silent action. As this busbing of boles is necessary for many portions of the actions, it will be convenient to describe it now. And though it may seem rather a difficult and tedious operation to line with cloth a hole less than $\frac{1}{8}$ inch in diameter, it will not be found so in practice. Cut some strips of old woollen cloth—a piece of any old garment will do—about $\frac{3}{8}$ inch wide, and cut into lengths of $1\frac{1}{2}$ incbes. Cut them into a point at one end, and pass this point tbrough the hole to be bushed, draw tbe cloth a little way through, and glue the outside of it and draw that into the bole ; pass a bradawl or a wire through the cloth to press it well down to the sides of the bole, and when dry, trim off the clotb close to tbe wood on each side.

Having completed the backfalls, the stickers may be put into tbeir places by passing the top and bottom wires through their proper holes, previously, however, slipping a little disc of cloth or soft leatber over tbe wires, so that the ends of the sticker may not rattle against tbe key-tail or backfall.

Tbese clotbs may be purchased for 6d. or 8d. a hundred, or if you prefer to make them yourself, you can do so with a $\frac{3}{8}$ inch hollow punch, and then make a hole in the centre of each for the wire to pass through. The cloths are shown in the several sketches by tbe thick line at the top and bottom of each sticker, but are drawn rather larger than the real size in order to make them conspicuous enough.

Tbe front ends of the backfalls should come so that the holes through them are directly under the pulldown wires. A short length of wire tapped witb a very coarse tbread at the lower end, and having a small hook at tbe top end, is passed through the hole in the end of the backfall and hooked, in the manner which will be described, on to the pulldown of tbe pallet, and a leather button is screwed on to the tapped wire close up to the underside of the backfall. These leatber buttons can be purchased very cheaply, or made by the amateur in the same way as described for the cloths. The hooked end of the wire does not hook on to the pulldown wire itself, but on to a small disc or oval of soft leather, as shown in Figs. 70 and 71, and the leather is then hooked on to the pulldown, thus securing silent action. This is most essential, as nothing is more annoying, when playing on the instrument, than to hear grating and rattling of the mechanism. The hooks of the handblower of the bellows should be hooked into a stout leather looped on the staple in a similar way, otherwise the hooks would be apt to slip out on the descent of the feeder, besides being noisy. Or you may use wood connections instead of rope.

The next thing will be the roller board for those channels which are transferred to the treble end of the sound-board.

This may be made of $\frac{3}{4}$ inch mahogany about 3 feet 6 inches long and 6 inches wide ; the rollers themselves are of mahogany, and must be thoroughly seasoned. They are made about an inch wide and $\frac{3}{4}$ or $\frac{7}{8}$ inch thick, rounded off on the top and bottom edges. They work on a centre wire which is driven into each end, and passes through a stud tenoned into the board, and these wires should project an inch beyond the studs, to allow them to be drawn out by means of a pair of pliers if it should be required.

The rollers are shown in Figs. 62 to 65. Fig. 66 shows the studs, which can be expeditiously made in the following manner —Cut a piece about $1\frac{3}{4}$ inch wide off the end of a $\frac{3}{4}$ inch board of mahogany ; run a rebate along the top and bottom edges to form the tenon, and then round off the front edges. Drill a hole right through, then cut the slip into separate studs about $\frac{3}{4}$ inch thick, bush the holes in which the centre wires of the rollers are to work, and then smooth all off with glass-paper. We have now only to make the roller arms, which may be either of metal or wood. If of metal, make them of stout wire flattened out at one end, and having a hole drilled in it as shown in Figs. 64 and 65. Bore a hole in the roller slightly smaller than the wire of the arms, and then drive them into their proper places. The roller arms should project about $1\frac{1}{2}$ inch from the roller, and the holes in them must be bushed. There are only four of these rollers, so, if you like, you may make them all the same length ; and a strip of wood with four holes in it might be screwed on to each end of the roller board to receive the centre wires, instead of baving separate studs. This method, however, would not do where many rollers were required, as it would so greatly increase the weight and bulk of the roller board. In some actions there is a roller for every key. Rollers may also be made of $\frac{3}{8}$ inch iron gas piping by cutting it to the requisite length and inserting a wood plug in each end to receive the centre wires and the arms. A hole is drilled through, and the arm is then driven through and riveted at the back. These iron rollers and arms should be painted over with Brunswick black to prevent rust. As it is very necessary that the rollers should be placed close together and occupy as little space as possible, the gas piping is preferable to wood, and besides does not warp. The exact positions of the roller arms must

be obtained by actual measurement, the left hand arm being immediately over the tail of the key to which it belongs, and the right hand arm immediately under the end of its own backfall. The four transferred backfalls are shown at A A in Fig. 61, and the action of the roller is as follows: When the key is pressed down it pushes up a sticker as in the ordinary action, the top wire of the sticker, however, passes through the left hand arm of the roller, instead of through a backfall. The right hand arm of the roller is connected to the back end of its own backfall by means of a short sticker, and consequently that end is pushed up and the front end brought down as in the ordinary action. It is thus evident that, when a roller is used, the action can be transferred to any position right or left of the key pressed down.

For a two-manual instrument the lower manual is for the great organ and the upper manual for the swell, though the respective positions of the manuals are sometimes reversed. The great organ action is exactly similar to that described above, the stickers pass behind the swell keys, which is much better than making them pass through a mortise in those keys, as it then becomes impossible to alter one manual without interfering with the other. The backfalls of the swell organ rest at the front ends on the tails of the keys and should be thinned down where the stickers of the great organ pass between them. The key-tails of the swell manual should have a disc of leather glued on them, where the backfalls touch, to prevent noise.

Sometimes a tapped wire is passed through the ends of the backfalls and key-tails, but this is not absolutely necessary. The valves of the swell soundboard pull down from the back, and instead of using a sticker for that purpose as for a thrust or push action, we use what is termed a tracker, which is always adopted where a pull action is required. These trackers are made either round or flat; if flat they are about $\frac{3}{16}$ inch thick, and $\frac{5}{8}$ inch wide; if round they are about $\frac{1}{4}$ inch in diameter, and made with a bead plane the same as stickers. In either case the ends are cut pointed and a groove cut in them with a tenon saw. In this groove a tapped wire is placed, with the lower end bent and passed through a hole at the bottom of the groove; a piece of thin twine is then bound tightly round the ends of the trackers to hold the wire firmly, and is afterwards coated with thin glue. The wires are formed into a hook at the other end when required to hook on to a pulldown, or other connection. (See Fig. 69.) The backfalls are placed on a backfall rail the same as in the great organ, and the positions of the grooves in it are obtained in the same way as described for that one.

If any channels are transferred on the great soundboard the same must be done on the swell, and a roller board made in exactly the same way.

In the small organ with the twelve channels for the bass placed at the back a roller-board may be used for most of those channels. It is, however, quite possible to use long radiating backfalls, fixed at a slightly lower level than the treble backfalls, so as to pass beneath them, and in this case each backfall in the bass must be separately centred.

The action of the organ with the sound-board below the key-board (shown in Fig. 60) is simply a tracker and backfall action, the pallets being at the back instead of at the front, and needs no further description. The backfall rails of any of the organs are screwed on to the under-side of the wind-chest, or to pieces connected with the building frame, according to the position required.

Fig. 59 shows an action for a single manual with a sliding key-board. In this case there is no wire at the bottom of the sticker, but the stickers rest on a sloping ridge about $\frac{3}{4}$ inch high, which is made on the top of the key-tail and covered with soft leather. The stickers pass through holes in a rail, which is called a register, and are prevented from falling too low when the key-board is pushed in by having a little piece of wood glued on them. This arrangement permits the key-board to slide in like a drawer when not in use, and so prevents waste of space in the apartment. In Fig. 59, B is the register, C the piece of wood glued on the sticker, and D the sloping piece on the key-tail.

In my next chapter the stop action and couplers will be described.

(*To be continued.*) 369

BRAZING AND SOLDERING.

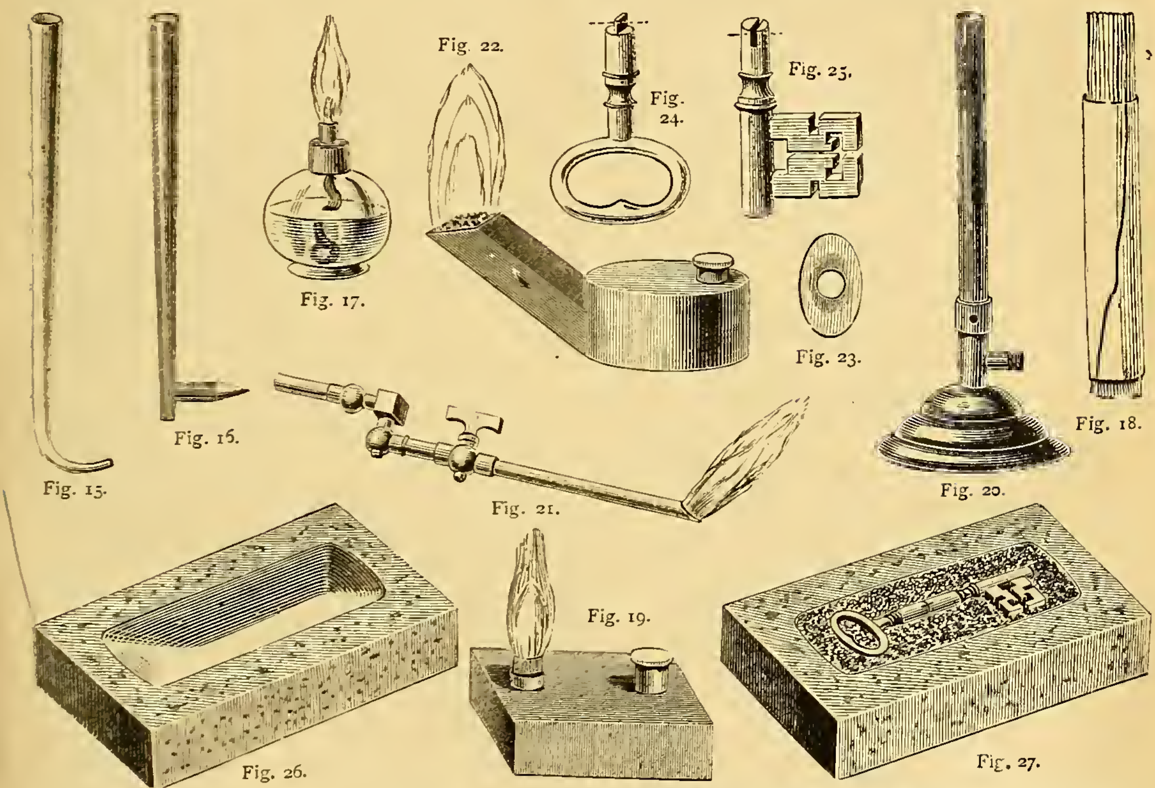
By GEORGE EDWINSON.

III.—SOLDERING COPPER, BRASS, BRONZE, SILVER, ETC.

ANY of the metals mentioned above, or the alloys of silver and copper with other metals, may all be united by soft soldering, but the joint thus made has the disadvantage of being weaker than the surrounding metal, and also liable to disruption from a temperature a little above the melting-point of the solder. Notwithstanding this unfavourable characteristic of soft soldered joints, there are many articles in daily use made of copper and of brass put together with soft solder. When the several parts of an article are made to fit each other with great nicety, they may be soft soldered together by a process termed "sweating." Warm the parts separately and tin the intended contiguous surfaces as the copper-bit was tinned, but

do not spill the solder on any part liable to be seen after the joint is made, nor put on more than the merest film of solder. When all have been thus tinned place them together, clamp them up tight, and grip the joints with a pair of blacksmith's tongs made red hot, holding them in this position until the solder runs. Or well clean the surfaces to be joined, moisten them with a little "killed spirits," and press them together with a thin strip of tinfoil between them, then clamp the parts up tight, heat them with the hot tongs or the flame from a blow-pipe, the tinfoil will then melt and unite the parts, making a neat and almost invisible joint. Or dust a few filings of solder over the cleaned and moistened surface, fit the parts together, and sweep the joint with the blow-pipe flame until the solder is melted. Before attempting to soft solder copper, remember that the parts intended to form the joint must be filed or scraped quite clean, then heated and tinned by rubbing on them a drop of solder with the soldering-iron.

Hard Soldering.—But the proper method of uniting the parts of the more infusible metals and their alloys is to employ a solder nearly resembling them in colour and in strength, and one that will require a comparatively high temperature to melt it. Such solders are named "hard solders," and the process is termed "hard soldering." As these solders will not melt under the heat from a soldering-iron, we must seek a source of heat that will melt them, and this is best obtained from a flame urged by the blast of a common blow-pipe; we shall therefore require other tools for this work. The blow-pipe, Fig. 15 or Fig. 16, may be bought at any ironmonger's or tool-maker's shop for 6d. or 8d., and will be a better tool than one made at home. The nozzle of Fig. 16 may be made to screw on and off, and thus will admit of various sizes jets being used; there is no such provision for regulating the jet of air from the nozzle of Fig. 15, so we must be careful to choose one with a small opening if the blow-pipe is required for fine work. With all its faults I like this form best. The proper way to use a blow-pipe does not come readily to the novice, who is apt to work far too hard with this tool until he has acquired some proficiency in its use through practice.



FIGS. 15, 16.—BLOW-PIPES. FIG. 17.—SPIRIT LAMP. FIG. 18.—RUSH TORCH. FIG. 19.—GRIFFIN'S BLOW-PIPE LAMP. FIG. 20.—BUNSEN BURNER. FIG. 21.—JEWELLER'S GAS JET. FIG. 22.—FLETCHER'S BLOW-PIPE LAMP. FIG. 23.—SHIELD FOR MOUTH BLOW PIPE. FIGS. 24, 25.—BROKEN KEY, FILED, WITH SLOT AND FANG. FIG. 26.—FIRE-BRICK, WITH CAVITY FOR COMPOSITION SUPPORT. FIG. 27.—KEY ON COMPOSITION READY FOR BRAZING.

There is a close analogy in learning to blow a steady jet of air through a blow-pipe and in learning to play a cornet, for in both cases the learner tries to eject a forcible blast from his lungs instead of making his cheeks a reservoir for the air. The secret of success consists in learning to breathe entirely through the nose, and to keep the cheeks filled with a continuous supply of air as a reservoir for the blow-pipe. Very little air is required to produce a steady, powerful jet, less, indeed, than most persons imagine. As the blow-pipe has to be held in the mouth firmly gripped by the teeth, leaving both hands at liberty to manipulate the work to be soldered or brazed, it will be best to electro-plate the mouth-piece of the blow-pipe or get it plated with silver, to prevent an unpleasant metallic taste of brass in the mouth of the operator. Another improvement, suggested by the well-known tendency of the tool to slip around whilst it is being used, consists of an oval shield placed around the mouthpiece of the blow-pipe about an inch from its largest end. The form of this shield is shown at Fig. 23; it is made of thin sheet brass or tin bent into a convex form, a hole is made through it to fit the blow-pipe at the position above indicated, and it may then be soldered to the pipe. It has been approved by practical blow-pipers who say that it forms an excellent support for both tool and lips. It may be well to add that the orifice of the blow-pipe nozzle should in all cases be under the sixteenth of an inch in diameter, as little or nothing can be gained by a larger blast.

Next to the choice of a good blow-pipe is that of the flame or fuel to be worked with it. Plumbers and gasfitters use a bunch of dry rushes smeared with tallow and wrapped in a coating of paper (Fig. 18). Some good work is done by the flame from this rude candle in the hands of a skilled workman, and there are many such who use it in preference to any lamp for the purpose that has yet been invented. The flame from a spirit-lamp, such as the one shown at Fig. 17, will do for fine work on very small articles; but a stronger flame from a wide wick is required for larger operations with very hard solder. A lamp with a wide wick made to burn a mixture of four volumes of wood-spirit to one volume of turpentine, is shown at Fig. 19, and may be bought for 1s. or 2s. of J. J. Griffin & Sons, 22, *Garrick Street*, *London*, *W*. A supply of air and gas consumed in a Bunsen burner (Fig. 20) is used for the purpose in laboratories, whilst jewellers use a jet of gas issuing from a brass pipe, shaped as shown, Fig. 21, attached to a swivel, or universal joint at the back of the bench. Mr. Fletcher, of Warrington, recommends a tin lamp made of the form shown (Fig. 22), the spout to be used as a wick-holder, and made large enough to take five or six thicknesses of inch-wide soft cotton wick, side by side, so as to make a large flaring flame. This lamp is to be used with the mixture of spirit and turpentine above-mentioned. The length of wick to be burnt in such lamps is generally regulated by pulling it up with a sharp pointed iron crook as required. A tin cap should be made to fit the spout to prevent evaporation of the spirit when the lamp is not in use, and a handle soldered to the back part of the lamp increases its handiness. These will suffice for soldering small articles by the aid of the mouth blow-pipe; to hard solder large articles the blast must be obtained from a more powerful apparatus than the human lungs, and applied by a specially constructed blow-pipe. Mr. Fletcher fixes the limit of weight to be hard soldered by the mouth blow-pipe as three ounces; a good workman with strong lungs might also manage to melt a piece of copper of the size of a halfpenny under the blow-pipe flame, but the amateur may be content with achieving less than this. When the metal to be fused or soldered is first heated up on a glowing hot bed of coke or of charcoal, and the blow-pipe blast is merely used to raise it to the last few necessary degrees of temperature, some larger articles and heavier weights may be attempted.

The work must be supported on a block of pumice stone, or on a stick of charcoal, whilst being hard soldered. Charcoal is considered best for the purpose, but any piece of charcoal will not do, for that made from oak and other hard woods will split, crackle, and spit sparks about when it gets hot, and thus disturb the work. Charcoal made from willow is considered best, but I have found an artificial bed of powdered charcoal to be the most effective of all. Finely powdered charcoal for this purpose can be purchased of J. J. Griffin & Sons at 6d. per lb. The method of making the bed is as follows: Finely pulverise some fire-clay in a mortar and mix it with some of the powdered charcoal in the proportion of one part clay to two parts by bulk of charcoal powder, form this mixture into a stiff dough with a paste made by boiling a tablespoonful of rice flour in half-a-pint of water. Now scoop a cavity in a fire-brick (Fig. 26), or in a lump of pumice stone, or in a "fire-lump" (*i.e.*, one of those lumps of fire-clay sold as a backing for stoves) to serve as a matrix for the dough, and form this matrix with some regard to the form of the work to be brazed. When the matrix has been formed, fill it with the dough, press this down firm, then bed the joint to be brazed in the dough, direct the blow-pipe upon it and sweep the flame over it gently until it is dry, or remove the article after its impression has been made, and allow the mould to dry in a warm place. Powdered pumice may be mixed with the charcoal instead of fire-clay, but the bed thus prepared is more friable and light than one made from fire-clay and is

not so effective for a heavy joint. Mr. Fletcher recommends a support made of china clay and powdered charcoal, but I have not tried this ; I should not hesitate to do so, however, if the ingredient was ready to hand, for that gentleman is a practical metallurgist whose advice and instructions command attention. Very light work such as chains and pins and other delicate articles requiring nice adjustment and fitting of the fractured parts, may be adjusted and supported as follows : Stick the parts together by wrapping a little soft sealing-wax or shellac around the fracture ; when this has cooled, make a mixture of plaster of Paris and very fine sand, moisten it with water to form a stiff paste, bed the work in this paste on a tile, and, when the paste has set, carefully scrape the paste away from the joint, warm the wax and wipe that off, then apply a paste of borax and prepare the joint for soldering or brazing. Heavy work to be done by large blow-pipes may be bedded on small lumps of pumice stone or on a mixture of this material and fine coke or charcoal, but this will be considered in detail further on ; at present, we shall confine our attention to light brazing by the mouth blowpipe.

Hard Solders.—These have to be selected to suit the work in hand, for one kind of solder may be altogether unsuitable, and another quite suitable to be employed in uniting a specified metal or alloy of metals. The principal point to guide us in our selection, next to that of suitability of colour, is that of fusibility, and then of affinity with the metal to be soldered. For instance, a soft brass, technically known as "spelter," is used for rough coarse work, such as brazing iron and copper, because it will melt at a much lower temperature than either of those metals, and unite with them when they are at an almost fusing or welding heat ; but "spelter" would not serve our purpose as a solder for uniting two parts of a brass article, since we should run the risk of melting the article at the same time that we melted the solder. We must, therefore, always choose a solder with a melting point several degrees below that of the metal to be soldered, but at the same time remember that the best joint will be secured by using a solder which has some affinity for, or some constituent akin to, the metal to be soldered. The solders for copper, iron, and brass are here given in the order of their fusibility.

Hard Solders for Copper, Iron, and Brass.

1. Copper, 2 parts ; zinc, 1 part. For iron or copper
2. Tough brass, 5 parts ; zinc, 1 part. „ „
3. Copper, 1 part ; zinc, 1 part. „ „
4. Copper, 4 dwt ; zinc, 6 grains ; tin, 9 grains. For strong brass.
5. Brass pins (tinned), 2 parts ; silver, 1 part. For strong brass or steel.
6. Copper, 13 parts ; fine silver, 11 parts. For brass.
7. Copper, 1 part ; brass, 1 part ; Fine silver, 19 parts. For brass.
8. Brass, 5 parts ; zinc, 5 parts ; fine silver, 5 parts. For brass.

A good tough malleable solder, suitable for copper, iron, infusible brass, or silver, is composed of equal parts of good tough brass and of fine silver. I have already given general directions for melting solders. The amateur will bear in mind that the most fusible metal should be put first into the crucible, and when brass or zinc is an ingredient, this should be added last, and plunged into the molten metal with a pair of copper tongs, then cover the surface of the molten metal with a layer of charcoal. One of Fletcher's injector furnaces will be found very useful for melting casting solders where a supply of gas can be obtained ; or a good smelting furnace with a strong draught will serve the purpose. After the solder has been melted it should be poured into water over a bunch or broom of twigs, to granulate the alloy, the grains should then be made red hot and pounded in an iron mortar, then re-melted, poured into an oblong iron mould previously made hot, then rolled or beaten into thin plates, or long thin strips. Although I have thus given some details of the process, I do not advise amateurs to make their own solders, unless they cannot be procured from a tool shop or a metal warehouse. Solders containing silver are termed silver solders ; those containing brass or zinc, with copper, are named spelter solders.

The Flux, for all hard soldering or brazing operations, is powdered borax, which is generally applied in the form of a paste made up with water. This paste is applied to the joint with a small brush or a feather, and serves a double purpose in the subsequent operations, for it not only protects the metal from the oxidising influence of the flame, but also holds the solder in position until it has become sufficiently liquid to flow into the joint.

I will now suppose the shank of a door key to be broken, and we wish to unite the parts by brazing. First file the two ends of the fractured parts, as shown in Figs. 24 and 25, and get them to fit as perfectly as possible, for on the fitting will depend not only the neatness of the joint, but also its strength ; therefore do not leave a crack on purpose for the solder to fill up, but trust to the subsequent treatment to effect that purpose. Some persons would now recommend that a hole be drilled through the parts, as shown by the dotted line, and the joint riveted with an iron pin before being brazed ; but the parts may be stuck together with wax, as before directed, bedded in the

charcoal and clay support (Fig. 27), allowed to dry, then cleaned and prepared for brazing. This done, paint the joint with the borax paste until it has been covered with the paste, then stick a few bits of No. 1 or No. 3 solder in the paste over the joint, and begin to gently blow the flame on the support, by the *side* of, but not *on* the key. If a coal-gas flame is used, this precaution must be strictly observed throughout, for the effect of the direct flame of the blow-pipe on iron and steel is to blister or scale the metal and render the joint unsound and brittle; the flame must therefore be made to glance back from the glowing hot support on to the joint, and thus surround it with a bath of reflected flame. And here the full value of the support will be experienced, for, whilst the charcoal burns and lends its heat to the flame, the clay binds it together, and prevents it from burning too fast, and, at the same time, holds the glowing particles together by the side of the joint. At first, the borax will swell up and rise above the joint like froth, so we must blow gently, and occasionally administer a gentle sweeping puff to the crest of the seething mass; it will then sink down on the iron, carrying the solder with it, and begin to fuse. Now urge the blast a little, and keep increasing it until the joint is bathed in flame spurting up by the sides, and the solder is seen to melt, tremble a little, then sink into the joint. The operation is now complete, and the article must now be allowed to gently cool before it is examined, filed up, and polished.

Articles made of copper and of brass should be similarly treated, but the solder from No. 5 to No. 8 will be best for brass, and care must be taken to have all parts of the joint perfectly clean, and fitting properly before the borax is applied. When the joints are thin and delicate it will be found best to file the solder and mix the filings with a paste of borax and water, before applying them to the joint. Where the joint will admit of it, the parts are tightly bound together with fine iron wire, known as binding wire, and also bound to the support of pumice stone, charcoal, etc., by the same means. Iron wire is selected because of its superior tenacity, infusibility, and softness. Copper and brass wires would be liable to be fused, and would also expand much under the influence of a high temperature.

Whilst heating up an article to be brazed we must remember that it is not enough to cause the solder to melt to complete the operation, but we must also raise the metal of the joint to a sufficiently high temperature just before the critical point of melting the solder, for the molten solder to unite with the metal and form an alloy. We must therefore first turn our attention to the heating the joint and only turn the jet of flame upon the solder at the last moment. As most metals (and especially copper) conduct the heat rapidly away from the joint, it is always best to concentrate the heat around the joint, and confine it there, as on the supports already mentioned, instead of holding the articles in a vice, or a pair of tongs, or laying them on a piece of iron. After copper or brass articles have been brazed, they may be plunged almost at once into cold water, to cool them, without doing them any injury, but iron articles should not be thus treated, unless we wish to harden them.

I must leave the consideration of hard soldering silver, bronze, and jewellery, until my next paper, and also some remarks on brazing larger articles by the flame from artificial blowers.

(*To be continued*)

WRINKLES FOR AMATEURS.

By VARIOUS HANDS.

V.—MOUNTING SWITCHES OF TELEPHONES.

[*From SUNLIGHT.*]

WHILST fully agreeing with Mr. Sayer, that each amateur may have his own way of carrying out his instructions for making a pair of telephones—as to binding screws, etc., for instance—and duly appreciating the excellent manner in which he has handled

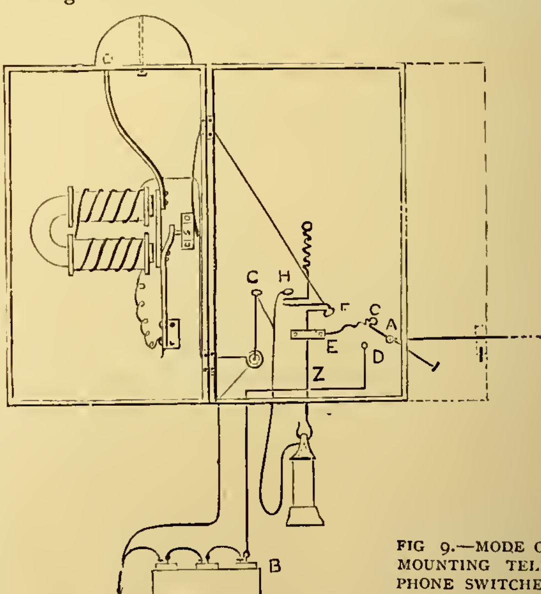


FIG 9.—MODE OF MOUNTING TELEPHONE SWITCHES.

his subject, I think that the following suggestions may be of use to those friends who are fitting up telephones and bells, and trust Mr. Sayer will excuse any apparent interference on my part with his work. To commence then, instead of simply mounting the switches and screws on a board, I think it is advisable to fit them on the back of a kind of box or case, the front of

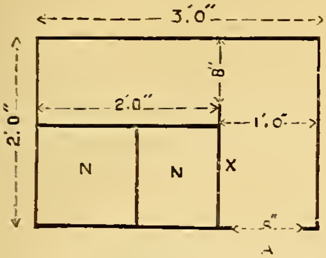


FIG. 11.—SECURITY EGG BOX. PLAN.

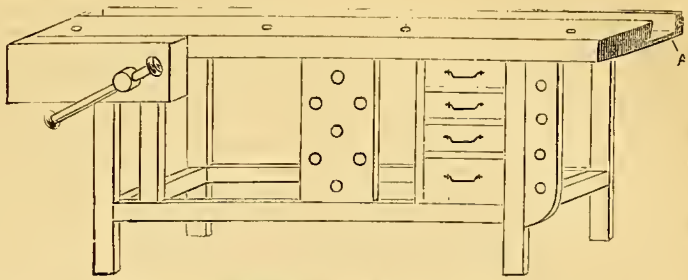


FIG. 16.—CARPENTER'S BENCH FOR AMATEURS.

FIG. 10.—SETTING-OUT KNIFE.

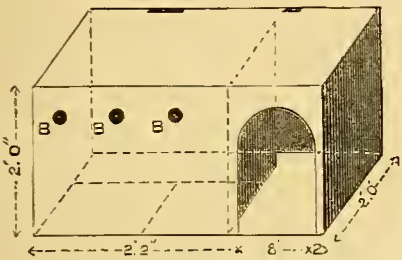


FIG. 12.—SECURITY EGG BOX. VIEW IN ISOMETRICAL PERSPECTIVE.

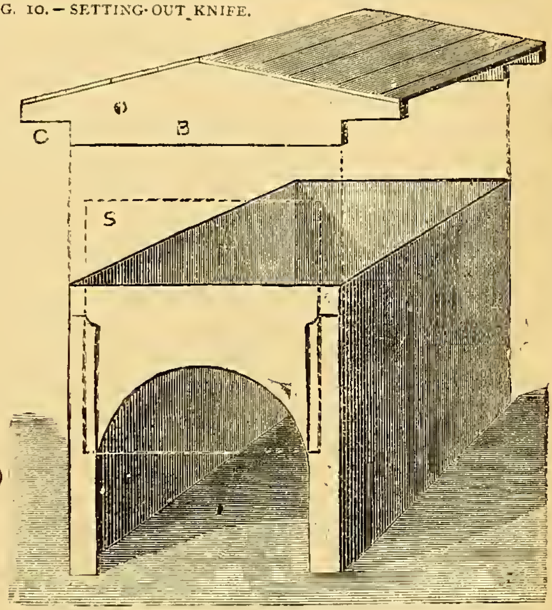


FIG. 13.—HATCHING BOX, SHOWING MOVABLE TOP.

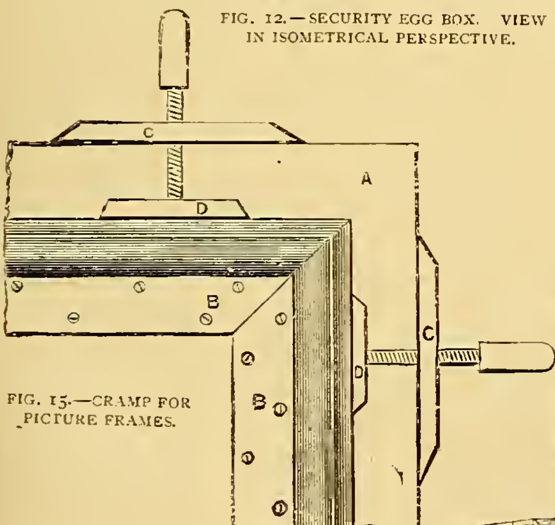


FIG. 15.—CRAMP FOR PICTURE FRAMES.

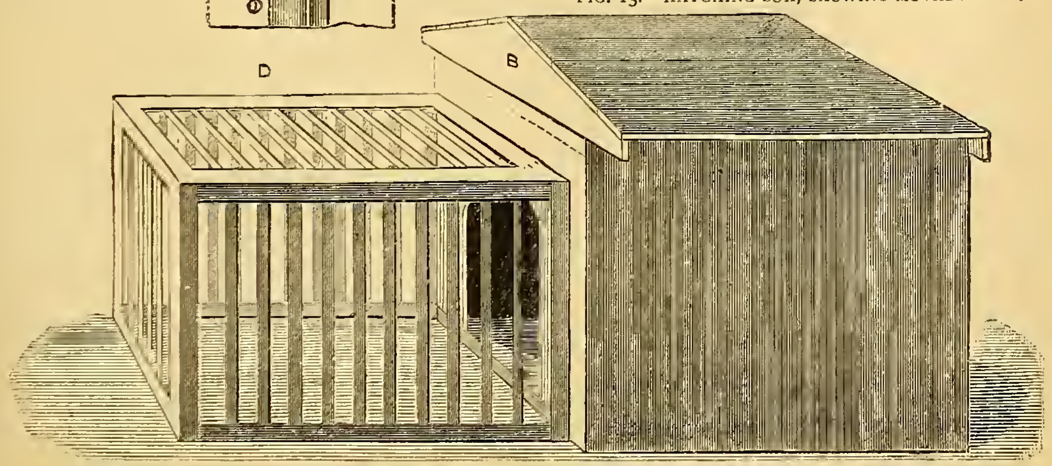


FIG. 14.—HATCHING BOX COMPLETE, WITH CAGE OF LATHS IN FRONT.

which is hinged to the body, and opens as a door. A hole must be bored in the bottom of the case, through which the hook, Z—on which the telephone hangs—is to pass, so that the telephone, when not in use, hangs underneath the box. The switch A and the screw D must be carried higher than in Mr. Sayer's diagram, and the bell with magnet, etc., can either be placed in a box on the top of the telephone switch-box, or if the lid of the case be made box-shaped (which I recommend), then the bell, magnet, and armature can be fitted in that, and simply the bell itself fixed outside, on the top of the case, through a hole in which the clapper must pass. Fig. 9, in which I have used the same letters as those in Mr. Sayer's diagram, will, I think, clearly illustrate the foregoing.

VI.—NEW USES FOR OLD KNIVES.

[*From R J. B.*]

THERE are one or two very simple, but exceedingly useful tools which no carpenter or cabinet-maker *would*, and which no amateur *should*, be without. A few words regarding the manufacture, use, and care of these may be of interest to amateurs. No careful mechanic ever sets-out his best work with a pencil. A "setting-out knife" is used for all accurate work, as with it a much finer line can be obtained, and consequently greater *nicety* than with a pencil. These knives can be bought at most tool-shops; but, as many amateurs enjoy making their own tools, whenever possible, I would give them this piece of advice: Whenever an old or discarded dinner-knife comes into your possession, or within your reach, secure it, and preserve it as a treasure. Assuming that a knife has been begged, borrowed, or found, having a blade 4 or 5 inches long, screw it into a vice so that about 1½ inches of the blade next the handle may be broken off (with the handle) by a smart blow from a hammer. Grind this shortened blade to the shape shown in Fig. 10, and finish off on an oil-stone. Now, the piece of broken blade which yet remains should be again broken into pieces 1½ or 2 inches long. These "bench-knives" are used to hold pieces of wood firm upon the bench while being worked. If, for example, a piece of stuff is to be beaded or chamfered, unless its own weight renders it steady, the bench-stop is, by itself, insufficient for that purpose, for a sideway pressure has to be exerted, which tends to force the wood away from the tool. To remedy this, take a "bench-knife," and having driven the stuff home against the bench-stop, drive the knife into the other end of the wood and into the bench at the same time. When, as in the Skeleton Hanging Wall Cabinet, shown and described in Vol. I. of AMATEUR WORK, a number of pieces have to be lined in exactly the same manner and measurements, it is important that they should be kept perfectly still during the process of setting-out. Here again two or three old knife-blades will serve your turn better than any other tool, hand-cramp, or what-not, however expensive the article might be. Lay all the pieces of wood of the same dimensions and use, close together, side by side, and drive into each end of the set a knife-blade. You can then turn your work over to square both sides.

VII.—THE SECURITY EGG BOX.

[*From F. HASSARD.*]

THIS box is of very simple construction; an ordinary packing-case can be easily adapted. The size will vary for number and sort of fowls, bantams and small kinds requiring less spacious boxes than brahmas. Take a packing-case (the one illustrated is 3 ft. by 2 ft. deep, 2 ft. high, see plan, Fig. 11, and elevation, Fig. 12), about 1 foot from one end put a partition reaching to within about 8 inches of the back, fixing it by nails to front and bottom. Make a hole for hens to go in at between partition and end, round or square at the top, the hole 8 or 9 inches wide, by 28 inches high; inside of this partition put a piece of wood 2 or 3 in. square, or if preferred bricks can be used to form nests. Bore some holes, B, B, B, 1 inch diameter round sides and ends to admit light and air. Fix the cover of the case with hinges (butts are best), and put on a lock and key, which latter keep in your own pocket. Now it will be at once evident that eggs can not be abstracted from the nests, unless a very small boy—in case of very large fowls—crawls in, as no one has an arm long enough to reach round the partition to get at the eggs. These boxes may be left about any where, and it is astonishing how fond hens are of going to them when once they find them out. A visit once a day to collect eggs is sufficient, and the eggs are safe, and the continual watching to collect them as hens lay, so often necessary, is obviated. Any amateur can easily construct a box, or convert a case into one, with a few nails, hammer and saw, and bradawl.

VIII.—HATCHING-BOX.

[*From F. HASSARD.*]

I SEND you a sketch of a hatching-box I have often made and used; its simplicity is its chief recommendation. Get a large tea-chest, A (Fig. 12), cut a hole, round or square, in the front of it, and nail two pieces of wood with a groove, or, easier still, nail two pieces the one over the other, but the edge of one projecting ¼ of an inch over the other. Nail them on, on each side of the hole. They will form a groove for the door to slide in. Each piece may be ½ inch or ¾ inch thick. It is better to mark the hole, nail on the pieces and then cut out the hole, as it is easier to nail them on and makes the end firmer to cut the hole in. To form roof, cut two pieces of ¾ in. or 1 in. board in the form B, just to fit inside the chest, going

in about 1 inch at C, and forming a projection or eave, say about two inches. One piece will be at one end of chest, one at the other. Nail some thin pieces across these ends overlapping, or if weather-boarding can be had, so much the better, or if you have a spare piece of felt it can be nailed on to the boards, which in this case, need not overlap. The boards should project at each end over B (Figs. 13, 14), to keep out wet. The roof lifts off, as shown, so that a hen, with eggs or chickens, can be inspected at any time. The space between the roof and edge of chest, when roof is on, admits air. You must have a piece of wood to slide up and down (shown in dotted lines) in the piece nailed on side of the hole, so as to shut the hen in when you wish ; also at night. Now get some laths and construct a cage, D (Fig. 14), to place in front of the door, and the apparatus is complete. Given, any old box, any old pieces of chests, a few laths (sawn are the best), a few nails, hammer, and saw, and a coop may be constructed by a non-professional.

The hen is put on the eggs, and is generally shut in at night by letting down the sliding door. In the morning, place food and water in the outer cage and lift up the slide ; you may go to your daily avocation knowing that she will take care of herself, and cannot get out, and will return to her eggs unmolested by other hens. When the chicks are hatched, they live with the hen in the same coop, and will stick to it when she is again in the poultry-house, if you let them, but if not, they go with the rest ; and the box, being previously lime-whited inside, can be used again. It is well to shift the box every other day or so, to give the hen the benefit of fresh ground ; by doing this at night, or after the birds are at rest, no trouble is entailed, and all is ready again by the morning.

When I first made these hatching-coops wire runs were not known, but for people living in out-of-the-way places my plan is as good as the most expensive.

IX.—CRAMP FOR PICTURE FRAMES.

[*From A PRO.*]

SEEING you have started some articles on picture-frame making, reminds me of a very handy appliance I made some time ago, for the purpose of holding the frame while nailing, or otherwise securing the mitres ; of which I send a rough drawing. It will take any width up to 3 inches, which is, I suppose, large enough for most amateurs. The base consists of two pieces of beech 1 foot 6 inches long and 7 inches by 1½ inches in width and thickness, halved and screwed together in the shape of a right angle, as shown by A. Two strips, marked B, B, 11 inches by 2 inches by ½ inch, are mitred and screwed on the base, they must be exactly square, and parallel with the outside edges of base.

The two strips, C, C, are 9 inches by 3 inches by 1 inch in size. They must be tapped with a ¾ inch tap in the centre of each length, and ⅜ inch from one edge, they are then screwed on the outside edges of base. Next come the two blocks, D, D, 4 inches by 1 inch by 1 inch, with a ⅝ inch hole bored to the depth of ½ inch in the centre, to take the ends of the screws. The screws are to be 8 inches length of thread and a 3-inch handle. Any turner will make the screws, and tap the holes for them in the two strips. It had better be made entirely of beech. Amateurs will find this cramp decidedly easier to use than the vice, and with less danger of damaging their moulding.

X.—CARPENTER'S BENCH FOR AMATEURS.

[*From AN AMATEUR.*]

The accompanying illustration (Fig. 16), gives a tolerably correct representation of a carpenter's bench, which I made for my own use a few years ago. It is drawn to scale as near as I could do so with a rule and pencil. I think it is sufficiently clear to be understood. It is 6 feet long, 22 inches wide, and 2 feet 7 inches high. The legs are 3 inches square, and the front of the top is a 3-inch plank, 11 inches wide. The wooden planing-vice is 21½ inches long, 7 inches wide, and about 2½ inches thick. At the other end of the bench are four drawers 10 inches wide. The top drawer is divided into 6 compartments, for nails screws, and small articles. The board, with 7 holes, slides between the screw and the drawers. For planing longer boards, another piece of wood, with 4 holes, is fastened to the leg on the other side of the drawers. The drawers go in about an eighth of an inch, so that the handles, which are simply cords knotted on the inside of drawers, may be out of the way when planing the edges of boards. At A is fixed a small iron vice. There are 3 holes in the plank for an iron clamp. Near the screw end of the bench is a square piece of ash about a foot long and 1½ inches square. This goes through the plank at a slight inclination, fits tight, and can be hammered up or down, according to the thickness of the wood planed against it. I hope to add a German screw to the right hand end of the plank, and then, I think, it will be complete.

VELOCIPEDES:

THEIR CONSTRUCTION AND USE.

By A. STEPHENSON.

V.—SMALL WHEEL, FORKS, AND STEERING GEAR.

WE now come to describe the small wheel, hubs, forks, steering centres, etc. As for both wheels they are identical, it will only be necessary to describe those of one.

The hub is a solid casting of hard brass. It is shown in section, Fig. 1. It is 3 inches long, and

$2\frac{1}{2}$ inches in diameter on the flanges. The body, or connecting centre, is 1 inch thick. The flanges are $\frac{3}{8}$ inch thick on the edges. In Fig. 1 the hub is shown with the ends recessed; this recession is not done in the casting, but in the lathe, after the operation of boring through for the pin on which it is to run.

The purpose of the recession is twofold—first, it allows the spoke-holes to be bored through, thereby making them easier bored and easier tapped. Secondly, the recession holds a leather washer, which is fitted to the thickness of the pin, and is held in place by the recession being dovetailed, as shown in the section. This washer serves, in a great measure, to keep dust or mud out of the bearing.

This hub is what may be called a plain or parallel bearing, the pin which passes through it being a straight piece of smooth, round, hard steel, $\frac{5}{8}$-inch thick. The ends of this pin are reduced and screwed for $\frac{3}{8}$-inch nuts. One end has a squared portion (A), to prevent it turning in the fork end, which has a square hole to receive it. The pin is shown in Fig. 2.

The pattern for this hub is made flush or plain at the ends, so as it may draw easily in the casting. The casting is chucked in the lathe and bored through with

FIG. 2.—PIN.

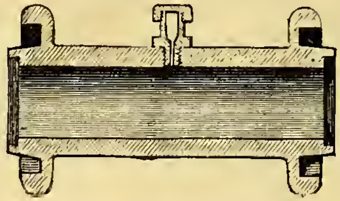


FIG. 1.—SECTION OF SMALL WHEEL HUB.

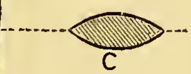


FIG. 3.—SIDE OF FORK.

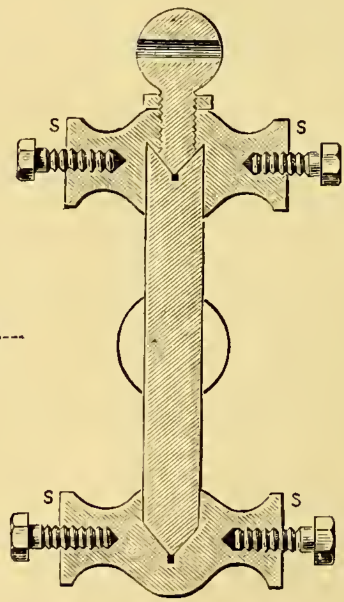


FIG. 4.—SECTION OF SOCKETS OF STEERING CENTRES.

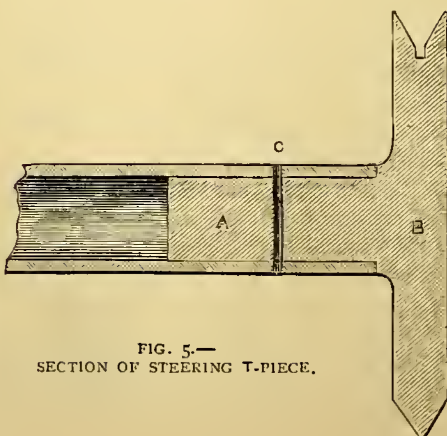


FIG. 5.—SECTION OF STEERING T-PIECE.

$\frac{5}{8}$-inch twist-drill, and the ends recessed, after which it is fixed on mandril, mounted in the lathe, and finished on the outside. That part of the flange where the spokes pass through is $\frac{1}{2}$ inch thick, which leaves $1\frac{1}{2}$ inches for the leather washer, which is a $\frac{1}{4}$ inch thick.

In Fig. 1 a lubricator is shown in the centre, the hole for it is bored, and the lubricator fitted before the wheel is put up.

So much for the hub, now for the forks. The forks are made in two separate parts of good wrought iron. One side of a fork is shown, Fig. 3. At the upper end it is 1 inch broad and $\frac{1}{4}$ inch thick, tapering to $\frac{5}{8}$ inch broad at the narrowest part. The circular part at the bottom is 1 inch in diameter, and has $\frac{3}{8}$ inch hole to receive the pin. At the upper end of the fork side two holes are shown, $\frac{3}{8}$ inch in diameter and 3 inches apart. These receive the set screws, which hold the connecting sockets which carry the steering centres. The length of the fork side, from the bottom socket hole to the axle pin is 11 inches, or sufficient to admit a 20-inch wheel with the rubber on. The forks are forged square on the edges, and are afterwards filed from below the sockets to a thin edge, as shown in section, Fig. 3, C.

A section of the two

sockets, with the steering centre in place, is shown, Fig. 4. In it the four studs S are shown, these are $\frac{3}{8}$ inch thick, and serve to attach the fork sides to the sockets. The sockets themselves are $2\frac{1}{4}$ inches long, 1 inch in diameter at the ends, and $1\frac{1}{4}$ inch in the centre, which is somewhat ball-shaped. They are finished up in the lathe, then the ends are drilled $\frac{5}{16}$ inch for screwing, and in the centre of both sockets a $\frac{3}{8}$-inch hole is drilled *half* through; the remainder of the upper socket is bored with $\frac{7}{16}$ inch drill to screw for $\frac{1}{2}$-inch set screw, as shown in section, Fig. 4.

This set screw has a ball head, with a hole drilled through for turning it round with a tommy. It is screwed up to the ball and a jamb-nut put on, which is screwed firmly down when the steering neck is properly adjusted.

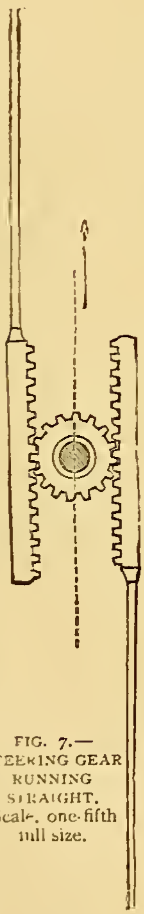


FIG. 7.—STEERING GEAR RUNNING STRAIGHT. Scale, one-fifth full size.

A section of the steering neck is shown in Fig. 5. It is made in the form of a T; the part A, 3 inches long, is made of a thickness to fit inside of the tube forming the backbone, or long side of the frame. The ends of the upright portion B, are turned to fit in the socket-

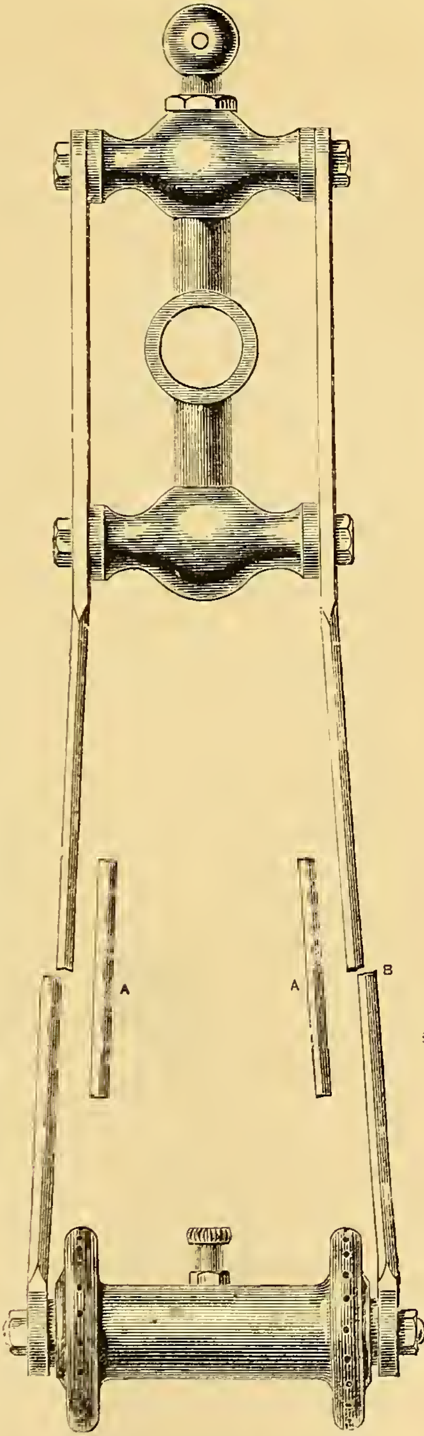


FIG. 6.—FORK PARTS FOR ONE WHEEL PUT TOGETHER.
Scale, half full size.
N.B.—The full length of this figure is obtained by inserting the pieces A, A, between the broken parts at B, B.

holes, the lower end is coned to the same angle as the boring drill, while the upper end is recessed to a similar angle to receive the set screw. This piece is made a good fit in the tube and brazed. Before brazing, a small hole is drilled through, and a wire pin, C, driven through it, to prevent the T-piece shifting its position in the tube in the process of heating and brazing.

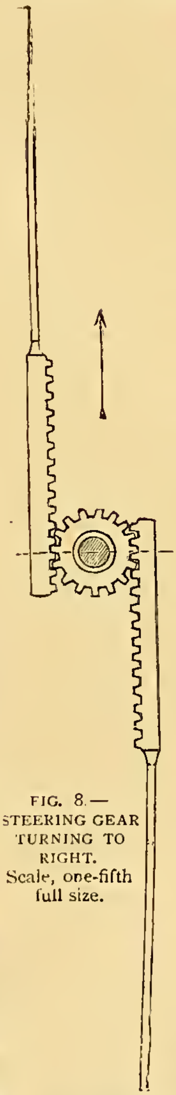


FIG. 8.—STEERING GEAR TURNING TO RIGHT. Scale, one-fifth full size.

Now, as two of these T-pieces are required, one in each end of the long side tube, care must be taken that they are both placed in the same plane—that is, that they may both stand in a vertical position—when in the finishing machine, otherwise the two steering wheels would not stand at right angles with the ground, as they ought to do. The time to see to this is before drilling the second one for the wire pin. Any defect in this respect could be rectified by twisting the tube when heated for bending. These T-pieces may be brazed in while the tube is straight. The setting or bending to the curve shown in the engraving of the machine will be described when we come to the construction of our frame.

Fig. 6 shows the various parts herein described put together; namely, the two sockets, with the steering neck, the fork sides fixed in place, and the hub, with its pin or axle, also in place.

Now as to the means of steering, or turning these two wheels with their forks. The parts are—two short arms projecting from the fork sides, two steering rods of $\frac{3}{8}$ inch round wire, two ratchet pieces, and a spade handle with a small pinion on its shaft.

It is to be noted that the two wheels are turned in opposite directions—one in, the other out, so that in turning the machine the two wheels are always running in the same circle, and consequently making but one track. To effect this, the makers of the Coventry Rotary Tricycle put a short arm on the *inside* of one fork and a similar arm on the *outside* of the other, and connect the two by a long steering rod. This rod has a part of it opposite the small pinion on the spade handle flattened out, and teeth cut on its edge to engage with the small pinion. This is a very simple arrangement, but looks rather awkward to have a long rod running at an angle with the long side tube, on the inside of it for half its distance and on the outside the other; besides, the short arm on the outside of the fork really makes the machine some three inches wider.

My machine was so fitted at first, but I made an alteration which I think is an improvement. I placed the short arms on the *inside* of both forks; then, in place of a continuous rod, I have two rods—one from the front fork to the steering handle and engaging with the *inside* of the small pinion, and the rod with its ratchet coming from the hind wheel and engaging with the *outside* of the pinion. The two wheels are turned just the same as in the former method, but it is a much more mechanical-looking arrangement; besides, the short arms being inside in both cases are more out of the way, and the machine will now enter a much narrower doorway.

The above arrangement will be clearly seen in the diagram, Fig. 7, wherein the dotted line shows the direction of the steering spade handle when the machine is running straight ahead. In Fig. 8 the handle has received a quarter of a turn; the front wheel is now turned to the right, while the hind wheel has been turned in a corresponding degree to the left. The machine is now running in a circle of 7 or 8 feet, the steering wheels being inside and both running in one circle. Turning the handle back to the position of Fig. 7 brings the wheels in line, and the machine consequently runs straight forward; turning the handle in the opposite direction from Fig. 8 turns the machine to the left in the same degree.

In many tricycles the steering pinion on the handle is absurdly small, so much so that a full revolution of the handle has to be made before the full turning capacity of the machine is reached, so the rider has to twist the handle round as far as his wrist will allow, let go, and take another twist. This operation is extremely awkward on a rear-steerer when a sharp turn has to be taken, and I have seen learners completely at a loss how to turn their handle to bring their machine on the straight until they looked round to see the position of their back wheel.

In my machine the pinion is $2\frac{1}{2}$ inches in diameter. A quarter turn of the handle gives the full turning capacity of the machine, so in sharp turning you never require to leave go. It answers the helm at once, is not a bit too sensitive, you are always sure your machine will go in the direction you are aiming for when steering, which is more than can be said of a good many tricycles, especially after they have become somewhat loose in the parts with wear.

Our steering handle, with its connections and their attachment to the frame, cannot be described with advantage without the use of diagrams, and as the present article threatens to be overcrowded with these already, we must leave further illustrations to our next paper, in which a description of the materials and construction of the frame will be given.

(To be continued.)

THE GEOMETRICAL CONSTRUCTION OF FLOWER-BEDS.

By THE EDITOR.

VERY recently a rough sketch of a flower-bed in the form of a fleur-de-lys was sent to me by a correspondent, and the sketch was accompanied by a request that I would show him how the outline that he had sent might be traced geometrically. As will be seen presently, the working out of the process involves some little thought and consideration, and the information asked for is such as cannot be given without a somewhat elaborate diagram, or imparted in a few words. I have therefore taken the opportunity to give the instructions asked for in the form of a paper, and I do this all the more readily, because at least three purposes will be served by this course: for, firstly, the inquirer will receive far more complete teaching on the subject than could possibly be given in a simple answer to a correspondent; secondly, the paper may be of genuine assistance to him and many other readers who may be about to cut new flower-beds of various shapes at this time of the year; and, thirdly, it will show many of my correspondents how difficult it is to satisfy their wants in a few words, or, indeed,

to explain the information they are seeking for in any way than through the medium of a paper specially written to meet the want.

In Fig. 1 I have given what I conceive to be a good example of the fleur-de-lys, as used either as a heraldic emblem or charge, or for decoration of an ecclesiastical character. I have done this to show how unsuitable is the fleur-de-lys in its ordinary form for any other than the purposes just mentioned, and especially for a flower-bed, unless it were carried out on a very large scale—so large, indeed, that it would not be possible for the eye to gather in at a glance the outline of the bed itself, much less its various details when fully stocked with all the floral treasures that so vast a bed would hold. If I am asked to explain why this would be so, I need only point to the narrow spaces that intervene between the central member of the fleur-de-lys and those at the sides, both above and below the transverse bar that crosses and breaks the continuity of the three parts; and say that it would be impossible unless these spaces were at least 18 inches wide at the narrowest part—and for all practical purposes 3 feet would be better—to utilise them as a means of obtaining access to the interior of the bed, and at the same time to keep the turf of which they are composed in proper condition, and the verge or edge of the bed cleanly cut and well kept.

How, then, is the difficulty to be got over? Simply by conventional treatment of the form that is desired—that is to say, by effecting such changes in its general outline that, while they do not in any way destroy its identity with the object, natural or otherwise, from which it is taken, render it better adapted, and more suitable for the purpose which it is intended to serve. Whether or not this was felt by the delineator of the sketch of which Fig. 2 is a reduced copy disposed symmetrically, I cannot say; but be this as it may, it is clear that, for the reasons above stated, the sketch is far more suitable for a flower-bed than the true heraldic fleur-de-lys, and is, in fact, this form conventionally treated for the special requirement in view. I will now proceed to show how this design may be drawn geometrically, being mainly formed by arcs struck from certain centres. It is in the determination of these centres that the difficulty chiefly lies in laying out this or any other bed whose outline is chiefly composed of arcs of circles.

Referring now to Fig. 3, having determined the position of the bed, it is first necessary, by means of a garden-line and a couple of stakes, to lay down a central line, or axis, on either side of which the bed itself will be symmetrically disposed. This central line is represented in the figure by the straight line A B. In this straight line, at a suitable distance from the end A, select a point C, and through C draw the straight line D E at right angles to A B, and measure off along the line D E, C F, and C H, each equal to $2\frac{1}{2}$ feet. The figure is constructed on a large scale, and is shown on a scale of $\frac{1}{4}$ inch to a foot; the size of the bed, however, may be regulated at pleasure by changing the scale; for example, if the scale of the bed be taken at $\frac{1}{2}$ inch to a foot, then C F and C H will be each equal to $1\frac{1}{4}$ feet, and the actual size of the bed when cut will be just one-half of what it would be if carried out on a scale of $\frac{1}{4}$ inch to a foot.

By what has been done we have now obtained two points, F and H, at a distance of $2\frac{1}{2}$ feet from the point C, and therefore at a distance of 5 feet from each other. From the point F, with the radius F H, describe the arc K H L, and from the point H, with the radius H F, describe the arc K F L. These arcs give the outline of the upper end of the central lobe of the fleur-de-lys. To trace these arcs, drive in stakes at F and H, and have a piece of garden-line with a ring at one end that may be slipped over each stake in turn, and a pointed iron at the other, round which the free end of the line may be wound until the required length of radius is obtained.

From C now measure off along A B and towards B, C M = 7 feet if the scale be taken at $\frac{1}{4}$ inch to a foot, or = $3\frac{1}{2}$ feet if taken at $\frac{1}{2}$ inch to a foot, and from C as centre, with the radius C M, describe the arc N M O. From the point M set off along A B, and towards B, M P, P Q, and Q R, each equal to 1 foot (I shall from this point leave off calling attention to any difference in reading the scale, as my readers can work this out for themselves), and through Q draw the straight line S T at right angles to A B. Along this line, in opposite directions from Q set off Q S and Q T, each equal to $6\frac{1}{2}$ feet, and from K draw the straight lines K S and K T, through the points S and T. These lines cut the arc N M O in the points U and V, at which, as also at the points P and R, stakes should be driven in. From the point U, with the radius U X equal to $3\frac{1}{2}$ feet, describe the circle W X Y; and from the point V, with the radius V A′ describe the circle Z A′ B′. In these circles we obtain the upper arcs of the side lobes of the figure, whose extent will be determined presently.

Through the points P and R, now set off the straight lines E′ F′ and G′ H′, each at right angles to A B, and therefore parallel to the central line S T, and along S T, in opposite directions from Q, set off Q C′ and Q D′, each equal to 6 feet. Then, from C′ as centre, with radius C U, describe the arc W K′ L′ M′, cutting E′ F′ and G′ H′ in K′ and L′, and from D′ as centre, with radius D′ V, describe the arc Z N′ O′ P′, cutting E′ F′ and G′ H′ in N′ and O′. In the arcs W K′ and Z N′ we obtain the lower arcs of the side lobes of the figure, and the arcs L′ M′ and O′ P′ of the extremity of the figure below the transverse bar.

Now set off P E′ and P F′ in opposite directions from P along the straight line E′ F′, each equal to $3\frac{1}{2}$ feet, and R G′ and R H′, each equal to $3\frac{1}{2}$ feet, along the straight line G′ H′ from R, and also in opposite directions from this point. Join E′ G′, F′ H′, and the transverse bar of the fleur-de-lys is completed. Then from K′, with a radius equal to $4\frac{1}{2}$ feet, describe the arc M′ Q′, and from N′, with the same radius, describe the arc P′ R′. Lastly, from P′ as a centre, with a radius equal to 5 feet, describe the arc Q′ S′, and from M′ as centre, with the same radius, describe the arc R′ S′.

The lower part of the figure is now completed, and all that is left to be done is to connect the upper part of the central lobe with the upper arcs of the side lobes. This is done by laying down from P the straight line P V′, touching the circumference of the circle W X Y in T′ and the arc K F L in U′, and the straight line P Y′ touching the circumference of the circle Z A′ B′ in W′ and the arc K H L in X′. By the addition of the straight lines T′ U′, W′ X′, the outline of the fleur-de-lys is now completed in every part, and is exhibited in the diagram by a thick and solid line, the portions of arcs and straight lines that are not included in the outline of the figure being in dotted lines. The conventionally treated fleur-de-lys has been assimilated as closely as possible to the sketch originally sent, and copied in Fig. 2, and its outline has been geometrically traced as requested. If space permitted, a handsome cross might be formed of four beds similar to this, disposed so as to bring the lowest point S′ in each to the distance of about three or four feet from each other.

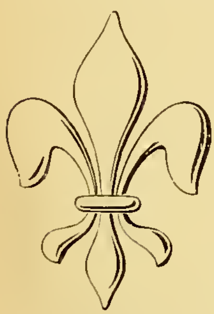


FIG. 1.—TRUE HERALDIC FLEUR-DE-LYS.

It is possible that many gardeners, professionals as well as amateurs, may find a little difficulty in setting out straight lines at right angles to each other, or, in other words, in setting out one or more straight lines at right angles to another straight line as the straight lines D E, E′ F′, S T, and G′ H′ at right angles to the straight line A B in Fig. 3. A contrivance for doing this without any trouble whatever is shown in Fig. 4, and this may be easily made by anyone who can accomplish a little simple joinery.

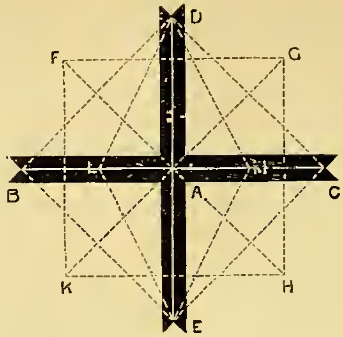


FIG. 4.—CONTRIVANCE FOR SETTING OUT LINES AT RIGHT ANGLES.

The first thing to be done is to cut out and plane up two slips of wood, 3 or 4 feet in length, about 3 inches broad, and $\frac{3}{4}$ inch thick, as represented by B C, D E in the figure. These pieces, when accurately halved together and secured by screws, will present the form of a cross whose arms are at right angles to one another. Notch the ends of the arms of the cross with rectangular notches, their points or apexes being exactly in the straight line running through each slip from end to end, equidistant from its edges. Paint the cross itself black, and the straight lines forming the central line of each slip, white, and at their point of intersection at A bore a hole from $\frac{1}{2}$ inch to $\frac{3}{4}$ inch in diameter. Now when a straight line has been set out by means of stakes and a garden line, as A B in Fig. 3, it is manifest that when the cross is passed *under* this line, that is to say the garden line, the line itself will lie along the white line, D E, if D E be the slip that is placed beneath it, and that when the hole at A is brought directly over the point C in Fig. 3, and another line is laid along and over the white line B C, the line thus laid down will be at right angles to the first line, A B. And provided that the four arms of the cross are of equal length, as they should be, a square, B D C E, may be immediately and quickly traced by putting in stakes in the ground, one in each notch at the ends of the arms, and laying down lines from stake to stake. Or if marks be set between A and B, and A and C, at equal distances from A, as at L and M, a diamond may be formed by laying down the lines D L, D M, E M, E L; and, by turning the cross so that the white line, D E, is brought into the position F H, and B C into that of K G, by laying down the lines F K, K H, H G, G F, forming another square, an eight-pointed star, having the points B, F, D, G, C, H, E, K, will be produced.

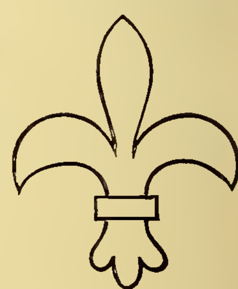


FIG. 2.—SKETCH OF FLEUR-DE-LYS FOR GEOMETRICAL TREATMENT.

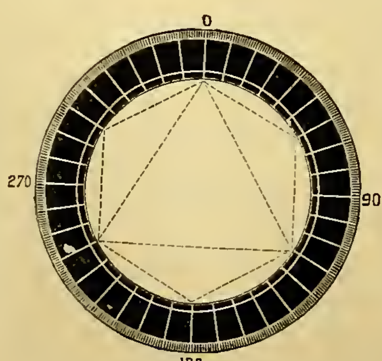


FIG. 5.—PROTRACTOR FOR GARDENERS.

In laying out beds and determining the inclination of straight lines at certain angles to each other, a protractor on a large scale, as shown in Fig. 5, will be found useful. This will assume the form of a broad ring, whose inner and outer edges are concentric circles. It may be easily made by cutting out arcs of wood of the necessary radius, in board $\frac{5}{8}$ inch thick, and arranging them in a double circle, so that the joints in the circle above come about the centres of the pieces forming the circle below, and *vice versa*, and then screwing the whole firmly together to form a solid ring of $\frac{3}{4}$ inch in thickness. For the inner edge of the ring, 2 feet will be found a sufficient radius, and from 2 feet 4 inches to 2 feet 6 inches for the radius of the outer edge. The surface of the ring should be painted black, and two circles traced on it, one at the distance of 1 inch within the outer edge, and the other at the same distance within the inner edge. The inner zone thus formed, and the central zone also, may be divided into spaces of 10 degrees, but the outer zone should be perfectly graduated in spaces of 1 degree, as shown in the figure. It will be useful to indicate the common centre of the concentric circles forming the ring, and traced upon it by wires traversing the central space from the points marked 0 and 180; and 90 and 270. These wires are not shown in the illustration.

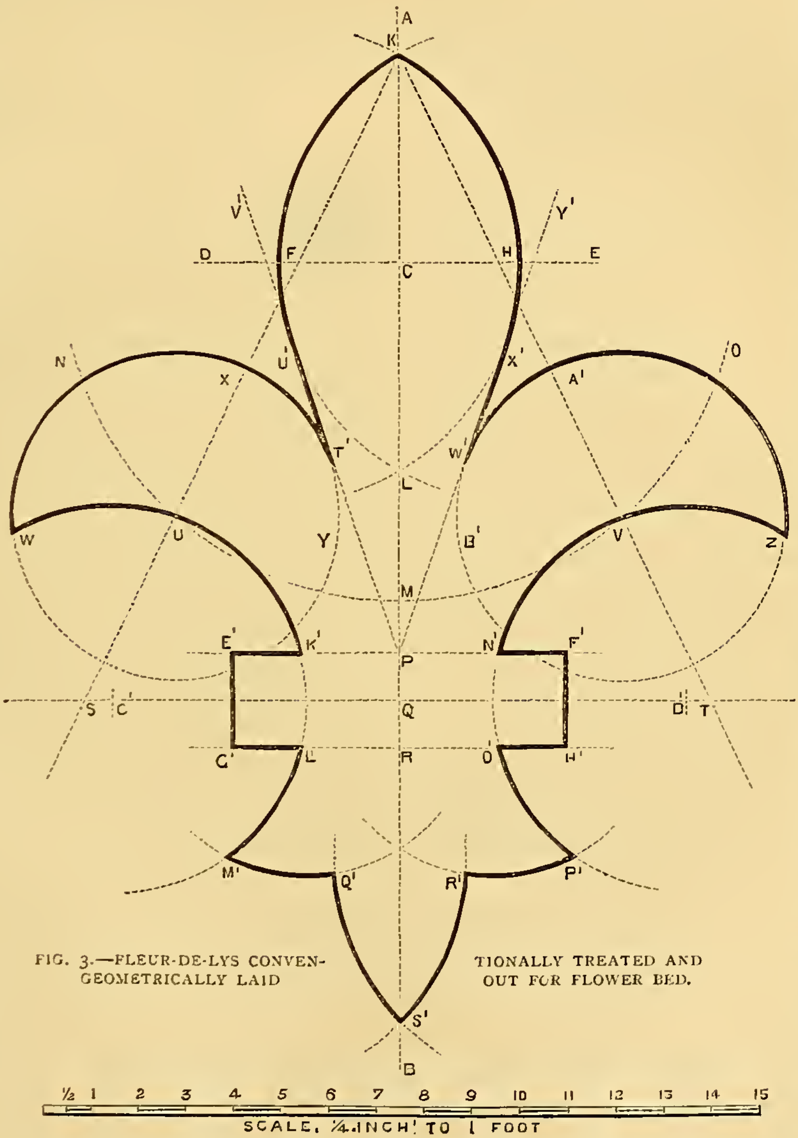


FIG. 3.—FLEUR-DE-LYS CONVENTIONALLY TREATED AND GEOMETRICALLY LAID OUT FOR FLOWER BED.

The circumference of a circle, it is almost needless to say, is divided into 360 degrees, a semicircle into 180 degrees, and a quadrant into 90 degrees. The number of degrees in an angle subtended by the side of any regular polygon, is obtained by dividing 360 by the number o sides in the polygon; thus the angle subtended by the side of an equilateral triangle is obtained by dividing 360 by 3, which gives 120. If then stakes be placed at intervals of 120 degrees round the inner or outer edge of the protractor, and straight lines traced from stake to stake, an equilateral triangle will be formed, as shown by the dotted lines traced in the interior of the figure. Similarly as an angle of 60 degrees is subtended by the side of a regular hexagon, or six-sided figure, this figure may be obtained by setting stakes round the protractor at intervals of 60 degrees, and drawing lines from stake to stake, as also shown in the interior of Fig. 5. Larger figures may be obtained by

laying out lines from the centre across the proper marks of division to any extent, and taking points in the lines thus obtained, equi-distant from the centre from which to lay down lines to form the boundary of the regular figure required.

For the convenience of those who are not able to read a plan by scale, I will conclude by giving the proportions of the various measurements above mentioned in terms of scales of ¼ inch, ⅜ inch, and ½ inch to the foot, which, if followed, will give the fleur-de-lys, exhibited in Fig. 3 in three different sizes.

MEASUREMENTS.		SCALE.		
		¼ in. to foot.	⅜ in. to foot.	½ in. to foot.
Semi radius, C F = C H .	=	2½ feet	1⅞ feet	1¼ feet
Radius F H = H F . .	=	5 ,,	3¾ ,,	2½ ,,
Radius C M . . .	=	7 ,,	5¼ ,,	3½ ,,
M P = P Q = Q R . .	=	1 ,,	9 inch	6 inch
Q S = Q T . . .	=	6½ ,,	4⅞ feet	3¼ feet
Radius U X = V A′ . .	=	3½ ,,	2⅝ ,,	1¾ ,,
Q C′ = Q D′ . . .	=	6 ,,	4½ ,,	3 ,,
P E′ = P F′ = R G′ = R H′	=	3½ ,,	2⅝ ,,	1¾ ,,
Radius C′ U D′ V . .	=	4 ,,	3 ,,	2 ,,
Radius of arcs, M′Q′, P′ R′ from centres K′, N′	=	4½ ,,	3⅜ ,,	2¼ ,,
Radius of arcs, Q′ S′, R′ S′ from centres P′, M′	=	5 ,,	3¾ ,,	2½ ,,
E′ G′ = F′ H′ . . .	=	2 ,,	1½ ,,	1 ,,

I trust that what has been said will be suggestive and helpful to many of my readers, both professional and amateurs, in designing and tracing the outline of flower-beds on geometrical principles.

WAYS AND MEANS.

[THE RECEIPTS brought together under this title are gathered from various sources. They are given here because they are each and all apparently possessed of value, and likely to be useful to the Amateur. It is manifestly impossible for the Editor to test them, or to have them tested, and he therefore disclaims all responsibility for their accuracy or otherwise. Amateurs who may try them are requested to communicate the results arrived at.]

SOLVENT FOR ANILINE.—In converting red aniline into a dye for staining wood, a very weak solution of alcohol is sufficient to hold the dye after it is once dissolved. In all probability if the colour is first dissolved in a small quantity of strong alcohol and then diluted with wood spirit, the result will be the same. It has been found by experiment that a very considerable proportion of water can be added to the dye without causing the alcohol to deposit it. Glycerine can also be used for dissolving aniline. A German writer says that "the aniline colours may he made to dissolve in water by dissolving them in a solution of gelatine dissolved in acetic acid." The aniline colour is added to this solution, which is made like a syrup in thickness. It is stirred until an evenly-coloured paste is obtained. Then the mixture is heated in a glue-pot for some little time. How much this will bear dilution we do not know, but some formula allow the dilution of alcoholic solutions of aniline to the extent of one-half with water.

TO FIX INDIAN INK ON PAPER.—It is a fact well known to photographers that animal glue, when treated with bichromate of potash and exposed to the sunlight for some time, is insoluble in water. It has been found by analysis that Indian ink contains such animal glue, and consequently, if a small quantity of bichromate of potash be used with it, the lines drawn with such prepared ink will not be affected by water, providing that they have been exposed to the sunlight for about an hour.

NOTES ON NOVELTIES.

WHO does not know what a nuisance it is to have a pair of blunt scissors, and to have to wait until some "needy knife-grinder" comes to the door to do what is necessary in the way of re-habilitating the edge of the exasperating implement. I am glad to be able to point out that anyone may free themselves from this source of annoyance by sending the moderate amount of 2s. 3d. to Mr. Edward Smith, *The City Toy Shop*, 3, *Cheapside*, *London*, *E.C.*, who will forward you, at once, in return, his New Scissor Sharpener (Registered), which will, as he truly says, put a better edge on a pair of scissors in ten seconds than a grinder will in ten minutes, and will not wear them away or destroy them. I have just tested the Sharpener on an old pair of editorial scissors, and can testify that it does its work to perfection. In form, the Scissor Sharpener is a little brass stand, which forms a bed for a broad file, which may be moved by means of a screw and spring below, so as to bring any part of it immediately below the rest, which forms part of the frame at one end, and against which the blades of the scissors are held in turn, during the process of sharpening. The process itself, indeed, is the simplest possible, for all that has to be done, is to hold the flat part of each blade firmly against the rest, and then to draw the edge, which rests on the file, across the file several times. Mr. Smith can show many specialties for various purposes, and no one who comes from the country on a visit to London, and finds himself close to St. Paul's, or the General Post Office, should fail to pay a visit to "The City Toy Shop," whether for toys, cutlery, pens, decorations for various times and seasons, or to have one's photograph taken, or portrait painted.

Messrs. Charles Churchill and Co., European Agents, 21, *Cross Street*, *Finsbury*, *London*, *E.C.*, have added to their large and varied stock of American-made tools, a supply of "The American Challenge" Cameras and Outfits for amateur photographers, manufactured by William H. Walker and Co., *Rochester*, *New York*, *U.S.* The Camera is supplied in three sizes, namely, to take a plate 3¼ in. by 4¼ in., £3 7s. 6d.; 4 in. by 5 in., £4 10s.; and 5 in. by 8 in., £6 15s., or with chemical outfit for negatives, and outfit for printing and toning, £4 8s., £5 15s., and £8 12s. respectively. There are, as a matter of course, many accessories to the above outfits and cameras, which may be purchased and used with advantage, but a price list of these will be found in a handy little eight-page pamphlet, which has no price marked upon it,

and which, I presume, is sent to anyone who is desirous of obtaining full and complete information on the subject. Walker's "Pocket Camera," complete with all necessary accessories, including among many others, which are too numerous to mention here at length, an achromatic lens with two diaphragms, a patent tripod head, dry plate holder, light-tight box for storing negatives, and ruby lamp for use in developing negatives, chemicals and appliances for developing 100 negatives, and finishing 500 to 1,000 photographs, is supplied for £3 10s. Its weight is 10 lbs., and it furnishes a complete photographic outfit, replete with all accessories that are absolutely required.

It is difficult to describe the American "Challenge" Camera completely without transferring the whole of the eight-page pamphlet that I have spoken of, to these pages bodily, but it may be useful to point out that it is accompanied by a rigid tripod of three jointed and folded legs, fitted with a tripod head admitting of the ready adjustment of the camera in the horizontal or vertical planes without the necessity of moving the legs of the tripod. The camera box is made of cherry wood, beautifully polished, and measuring only two inches in thickness when closed over the bed; its fittings are nickel plated and burnished, the tripod head and bed being of cast-iron nicely japanned. The pamphlet to which I have already referred contains definitions of the eleven requisites which every camera should possess. These apply to the tripod and tripod head, camera box, plate-holder, light-excluding shutters, focussing screen, bed, lens, and diaphragm. The makers challenge anyone to disprove that these requisites are not in accordance with well-known ruling principles, and that adjustments based on these principles are not absolutely necessary in a photographic camera. They further challenge—and hence the name of the camera—anyone to disprove that all such adjustments are not embodied in the "Challenge" Camera in such a way as to insure the greatest strength and compactness, together with the greatest ease and accuracy of adjustment. A little treatise published by the American manufacturers, under the name of "The Amateur Photographer," which contains much interesting matter, and also discharges the functions of a price list of the "Pocket Camera" and its accessories, contains as a frontispiece an exquisite photograph of a charming bit of woodland scenery, said to have been taken in a vacation ramble with Walker's "Pocket Camera" by a person totally unskilled in the art of photography. It is seldom, I imagine, that such marvellous success falls to the lot of the unpractised. Were it otherwise, there would be few even of those who seldom venture far from home who would be without Walker's "Pocket Camera" or some similar instrument.

Damp walls are a nuisance—a grievance, indeed, so common in brick-built houses, and so intolerable, that any preparation that is likely to prevent it and cure it deserves careful consideration. I find that Mr. G. C. Pulford, 77, *Cannon Street, and* 1, *Tower Royal, London, E.C.*, the maker of Pulford's "Magnetic Paints," has produced a paint for coating damp walls, known as the Iron Damp Wall Paint, sold at 46s. per cwt., or in 7 lb., 14 lb., and 28 lb. cans, at the rate of 6d. per lb. I have not yet had an opportunity of trying this paint, and I shall be glad to hear respecting it from any one who has done so. The testimonials given speak most highly in its favour: one gentleman who painted a very damp room with it seven years ago, and which could not be used on account of its extreme dampness, has found it an effective and permanent cure. The paint is of a rich chocolate colour, and has a great body. It contains a great quantity of iron, which forms a thin superficial coating to the wall, gradually becoming harder and harder as the oil is absorbed, and which will not flake or fall off. The dark appearance of the paint is no hindrance to its use, for when it is dry it can be painted over with any colour that may be preferred. Any wall, whether internal or external, should have two good coats, and it is recommended that in all rooms to be papered, even if they are not damp, one coat of this paint should be given to the plastered walls, as it greatly tends to preserve the paper.

Messrs. Crosby Lockwood and Co., 7, *Stationers' Hall Court, Ludgate Hill, E.C.*, send me a copy of the seventh edition, revised and enlarged, of "A Rudimentary Treatise on Clocks and Watches and Bells," by Sir Edmund Beckett, Bart., LL.D., Q.C., F.R.A.S., President of the British Horological Institute, and author of "Astronomy Without Mathematics." The book, which forms No. 67 of Weale's Rudimentary Treatises, measures $7\frac{1}{2}$ in. by $4\frac{3}{8}$ in., and contains 400 pages, with numerous diagrams and illustrations. Its price is 4s. 6d. In the preface to this, the latest edition, speaking of that portion of it which relates to clocks, the author says, "It should be understood that this professes to be a rudimentary treatise in the sense of teaching the principles of horology, and so much practical knowledge as may be useful both to clock-makers and to amateurs who wish to make, or direct the making of, their own clocks of superior character; and I have had abundant information that it has been useful in that way, besides vastly improving the general character of public clocks especially, in all the English-speaking world, and wherever large English clocks go." Such a book as this requires to be carefully studied, with thought and deliberation, and not cursorily run over, like the pages of a three-volume novel. The name of the author is a sufficient testimony to the value of the work, for of him, with reference to his own peculiar and particular subjects, it may be said, *nihil tatigit quod non ornavit.* To this I may add, from my own very slight knowledge of the subject and acquaintance with the book, that I am sure it would be most useful to me if I determined to take to clock-making as an amusement, and therefore I am justified in considering that it will be equally useful and acceptable to all amateurs whose fancy lies in this direction.

The Britannia Company, *Colchester*, who are tool makers by appointment to the British Government, and who number among the specialties which are made at their works, lathes, slide-rests, and chucks of all kinds for professional workmen as well as for amateurs, rose engines, machines for screw-making and fret-cutting, bicycles, copying-presses, etc., are certainly foremost among engineering firms and companies of a similar character in their endeavours to provide for artisans generally, and for amateurs in particular, tools and machinery that combine in a most desirable manner the quali-

ties of cheapness, excellence of construction, and thorough efficiency. The last achievement in this particular line was a cheap lathe, which was noticed in this Magazine, and which is offered at so low a price that no amateur, who wishes to try his hand at turning, need be without one, and to this they have now added a jeweller's chuck, and a contrivance for obtaining overhead motion in lathes of any size, for illustrations of which my readers are referred to Figs. 1 and 2. The little jeweller's chuck, so called because it is of a kind and size used commonly by jewellers in their work, differs from other chucks so called, in being made of solid steel instead of iron, the material that is generally used in the manufacture of chucks of this description. This chuck is particularly valuable to amateurs, because, by its aid many diverse operations may be performed, for it not only holds drills and carries a small circular saw, as shown in Fig. 2, but also carries leather and buff wheels and polishing brushes, such as used by jewellers in imparting a beautiful surface to metals, and may be brought into action by amateurs for polishing various articles other than metal. The price of this handy addition to the amateur's lathe is only 7s. 6d.

The means by which any ordinary lathe may be rendered suitable for the practice of ornamental turning is shown in Fig. 1. Two shafts, with their tops turned slightly towards the operator, are fixed, one at either end, in the rear of the bed of the lathe. These uprights carry two transverse bars, on the upper and nearer of which two grooved wheels are placed, one of which is set in motion by a cord that passes round it and the driving wheel below. When this wheel is set in motion the larger wheel towards the middle of the upper shaft is carried round; and by means of another cord imparts motion to a little wheel acting on part of the machinery below on the lathe itself, a pulley and bar, with weight attached, being placed on the lower transverse bar to regulate the action, etc., of the cord that has just been mentioned. I cannot, unfortunately, give the price, or rather the prices, of the different sizes of this overhead motion, which is now supplied by the Britannia Company for various sized lathes. For these particulars, having no information on this important point, I must refer my readers to the Company who, I am sure from past experience, will readily and quickly answer all inquiries, and content myself by pointing out that they claim to have made in this specialty the most handy overhead yet produced at a very moderate price.

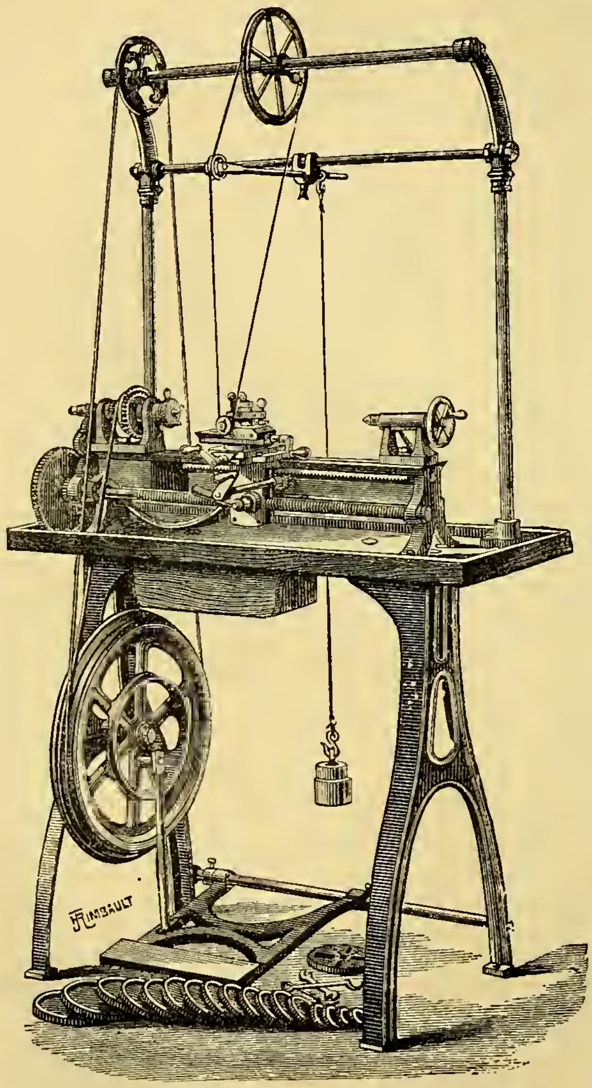


FIG. 1.—OVERHEAD MOTION FOR LATHE, MANUFACTURED BY THE BRITANNIA COMPANY, COLCHESTER.

We have all of us—all of us, I should say, who burn gas—our little troubles with gas lighting, and these arise chiefly from the inequality and irregularity of pressure from the meter, and our own incapability of being ever on the watch to accommodate the burners to the pressure. Something then is clearly wanted to do this most necessary part of the work for us, and this is found in the "Patent Hydrostatic Gas Governor," invented, patented, and manufactured by Messrs. Henry Greene and Son, Gas Engineers, 153 *and* 155, *Cannon Street, E.C.* "Coal gas," these gentlemen point out, "as supplied by the gas companies, is an elastic fluid considerably lighter than ordinary air, and this is shown by the fact that gas when consumed rises from the burner without any effort on the part of the consumer. It is, however, to this property above-mentioned that the simplicity of gas supply is due; but it is also the source of nearly all the waste of gas which takes place with badly-constructed burners and imperfect systems of gas lighting. Gas, then, being elastic, is, in order to give an adequate supply at all points in the street-mains or service, supplied at a high pressure, so that it issues at the burning point at a considerable velocity, a pressure and velocity very much in excess of what is required for the majority of gas burners. It is obvious, then, that before any system of gas lighting or any particular burner can be fairly tried, a *governor* becomes a *sine qua non*—an apparatus capable of

being adjusted to a given pressure, so that at whatever point to which it has been arranged to suit the particular burner adopted the pressure remains the same; and, further, it is a matter very important that the service pipes (of the house or building) and their connections are sufficiently large to allow an adequate supply of gas *to pass freely* at a *low* pressure. No greater mistake can be made in supplying a building with gas than to use pipes so small that sufficient can only be obtained when the gas is rushing out at a very high pressure. Recognizing these important facts, Messrs. Hy. Greene and Son have, after exhaustive experiments, perfected their Patent Hydrostatic Gas Governor.

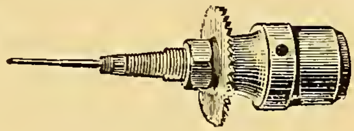


FIG. 2.—SOLID STEEL JEWELLER'S CHUCK.

"It has already been shown that the ordinary pressure of gas requires to be considerably reduced at the service point, but, having due regard to the fact that gas is an elastic fluid, it will be seen that the pressure or velocity is liable to constant variation on the consumer's side of the meter, in proportion as a greater or lesser number of lights are being used upon the premises, or even near to the premises. This can be illustrated by taking an ordinary oil lamp, with two burners of equal size fixed to the reservoir, both being alight; if one of the burners be turned out, the consumption of oil is reduced by one half, because the wicks are fed by capillary attraction only, the fluid being practically non-elastic; but if one of two gas-lights supplied from one source were extinguished, the reduction in the consumption would not be one half, because the gas, being elastic, will tend to rush out at the other burner, and, curiously enough, actually gives less light than it did before, but generates more heat, and, by reason of improper combustion, vitiates the atmosphere of the apartment. Messrs. Henry Greene and Son's Hydrostatic Governor *completely*, *effectually*, and *automatically* remedies this—a statement which admits of demonstration and proof available at any of their establishments.

"In the annexed diagram the working of the apparatus will be easily followed. The Hydrostatic Gas Governor is fixed on the outlet side of the meter, the pipes A and B being respectively the inlet and outlet pipes of the Governor, which the fitter adjusts, with due regard to the kind of burners in use and the amount of light required; once adjusted, there is no further need of attention, for the apparatus is so sensitive that the slightest deviation from the adjusted pressure is instantly compensated and corrected in the following manner: When an increase in the pressure takes place, its influence is immediately exerted upon the surface of the liquid in D (a liquid which can neither freeze nor evaporate, and is practically inalterable) causing a portion of it to be driven out, thus increasing the height of the surrounding liquid, raising the float C, and partially closing the valve E, to which it is attached, as the gas coming in at an increased velocity requires a smaller opening to pass the requisite quantity; when a decrease in the pressure takes place, the action is reversed, and the valve opens wider, because the gas, entering at a lower velocity, requires a proportionately larger opening. It will thus be seen that this Governor exactly meets the essential property of gas, in so far as it is an elastic fluid, and this beautiful degree of sensitiveness is equally apparent in the immense sizes used as district governors by the gas companies as in the smaller size adapted for domestic purposes. It will, moreover, be observed from the diagram that the only moving part is the combined float and valve, which simply floats; it is, therefore, practically impossible to get out of order by wear. The absence of any leather, india-rubber, or membrane diaphragm obviates the friction and irregular action attendant upon the use of these makeshifts, and, its action being entirely according to natural laws, it is free from all the drawbacks of mechanical regulators. The result, then, of the use of the Patent Hydrostatic Governor is this, that whether few or many burners are in use, they burn with an unvarying pressure, conducing to the saving to the consumer of from 15 to 40 per cent., with a softer and better light, and an immensely improved condition of the atmosphere in the apartment where the gas is burnt, the economy effected speedily recouping the first outlay for the Governor."

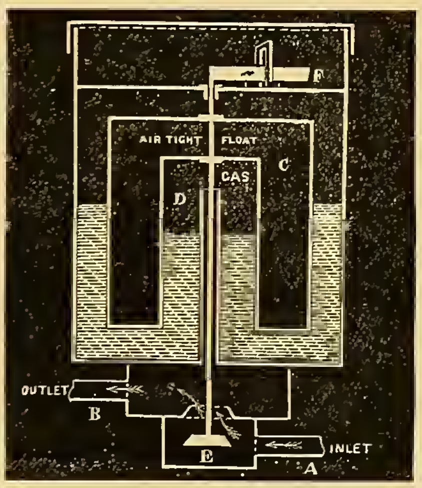


FIG. 3.—DIAGRAM SHOWING SECTION OF GREENE'S HYDROSTATIC GAS GOVERNOR.

No better arguments than the preceding could possibly be adduced in order to show the necessity of such an invention as that which is now under consideration, and no reasons more thoroughly practical and convincing could be urged in favour of its immediate adoption by all who are interested in keeping down their gas bills to the lowest possible point, and reducing the evils arising from the consumption of gas in dwelling-houses to a minimum by equalising the pressure and maintaining perfect combustion. The prices of the various sizes of the Hydrostatic Gas Governor are by no means high, and the cost of one will be saved, I am inclined to think, by the reduction of the gas bill in the first year after its adoption. The cost is—for three lights, £1 12s.; for five lights, £2; for ten lights, £2 16s.; and so on up to £10 for one hundred and fifty lights. The brass connections necessary for interposing the Governor between the meter and the supply pipe that carries the gas to the burners are included in the above terms. Persons may determine for themselves what sized Governor they will require by ascertaining what number of lights their meter is intended to supply.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Organ Building.

X. Y. Z.—I. You may get over your difficulty by retaining the board on top of the wind-chest, which is referred to as being used to test the soundness of the bellows and reservoir, merely cutting a hole in it to allow the wind to pass to the reeds.

2. The two boards at the back of the harmonium are no particular width, and the space between them may be filled in with a piece of glazed calico.

3. You may add a base board at the back, or let the foundation board in flush with the bottom of the ends, which you like.

4. I don't think cartridge paper would answer as well as veneer.

5. Two skins will be sufficient.

C. J. C. (*Haverstock Hill*).—I. It is very easy to cut the mouths of the pipes higher after the pipes are put together. The tool generally used is a sharp pen-knife, with which an extremely thin slice is taken off the edge of the upper lip. But I prefer to use the small glass-paper files which I described in Part XII. The edges of the lips should run thicker the higher the mouth is cut, and as the lips are already chamfered, all that is needed is to slightly round the lower edge of the upper lip after cutting up. It is not necessary to do as you propose with the pipes with inverted mouths, as it is just as easy to cut them higher as it is the ordinary ones.

2. The "old woman's tooth" is simply a plane with the mouth in the direction of its length instead of in the ordinary position. Make the mouth about an inch square on the under-side, and it will then take any size iron up to an inch wide. Plough irons or chisels may be used in it, and the cutting edge should project beyond the face of the plane to the depth of the intended groove.

3. Tuning files can be purchased at any general tool shop, so I believe can the tool above described, but you can easily make one for yourself.

4. The Bourdon wind-chest and sound-board will be described in the chapter on the Pedals.

5. You may cover the tompion all round as you propose.

As regards the canary-wood, I should think from your description it would be well suited for pipes, but I am not acquainted with it.

Musicus.—It is impossible here to give a detailed criticism of a specification for an organ with 18 stops and 11 accessory movements. The Vox Humana is a reed stop of 8-foot tone; the tubes are, however, only about 4 feet long to produce the C C note. Your room would not be high enough for such an instrument as you propose, and would be much better if it were made 4 or 5 feet wider.

T. J. (*Pontypridd*).—All the subjects you mention will be dealt with in due course. The husky sound of your old wood pipes may be caused by dust, the joints opening, or by imperfect fitting of the stoppers.

H. W. (*Chester*).—You have misread the passage you mention. It is only the caps of the Keraulophon stop that are to have the holes bored in them. Any of the organs described could be blown by the feet if the pedals were not used.

Diapason.—There is no objection to making the pipes in the manner you mention, but the tone would be of different quality to those made as I have directed.

J. B. (*Tyne Dock*).—I. You can utilise your paper pipes as a flageolet instead of a flute by discarding the twelve largest and making an extra octave to continue the treble to top G. Voice very softly.

2. You can use the Gemshorn as an 8-foot stop by placing the 4-foot pipe on the Tenor C channel, and so on all through.

3. There is always a tendency to make the treble pipes sound too loud. This can be rectified by slightly closing in the hole at the foot. The large pipes should be thicker than the smaller ones. I use six thicknesses for a 4-foot pipe.

4. Your specification will do nicely, but the Bourdon would be better if carried to two octaves (25 notes).

A. Z.—I. If your very old oak is really perfectly sound, by all means use it.

2. Your Stopt Diapason will do if you complete it to the same scale as you started with.

3. Yes. Different shaped blocks or mouths produce different qualities of tone.

Clonoony (*Moystown*).—1. Good oak will do well for pipes instead of pine. The chief reason it is not more used is that it is more expensive. The grain is thought by some to be too coarse for small pipes but the old builders used it even for their smallest pipes, with good results.

2. I don't think you will find it any more difficult to glue up.

3. Oak blocks will not require facing with mahogany if the grain is not too coarse.

4. All pipes are affected by change of temperature, and the paper ones are no exception to the rule. Wood pipes are seldom used in Holland on account of the dampness of the atmosphere. I believe there are only two stops of wood in the great organ at Harlaam.

The paper pipes will stand all changes if properly protected by paint or varnish as described. For a very damp climate it might be advisable to use a silicate paint, such as is used for waterproofing damp walls.

H. H. D. B.—Your pipe overblows because it has too much wind. Either the windway or the hole in foot is too large. Try closing in the foot a little, and I think you will find it all right. The whistling may be caused in the same way, but perhaps the wind is not properly directed on to the upper lip. A thin knife passed down the windway will very likely cure this defect. Only experience will enable you to remedy these kinds of defects, and that you will very soon gain if you are at all observant.

Maxwell, W.—I. The paper pipes may be made to sound exactly like metal. If your Open Diapason sounds too fluty, cut the top lip a little thinner at the edge.

2. There should be no hissing. See that there is no roughness where the wind passes at the mouth, and that the sides of the mouth are trimmed off quite level with the ears.

3. India-rubber tubing will do for conductors, but you will find it come very expensive. Why not use paper? You could make the bends with a short length of rubber tubing, if that is your difficulty.

5. I do not quite understand your meaning in this question.

W. W. (*Brighton*).—The Bourdon does not stand on the manual sound-board, but on a separate sound-board or sound-boards of its own, as will be described in due course; so if you do not require the Bourdon you have simply to omit it. The width of the slider and bearer of the Keraulophon stop may be deducted from the total width of the manual sound-board if you do not intend having that stop. The three inches at the top of the scale in Part XIII. is a misprint. It should be $2\frac{5}{8}$ inch as stated in the article.

To J. E. R.—The pine required to carry out Scheme 1. excluding the swell-box, case, and pipes would be about as under:—

$\frac{3}{8}$ inch ...	50 feet	12 inches wide.
$\frac{3}{4}$ "	40 "	
1 "	60 "	
$1\frac{1}{4}$ "	30 "	
$3\frac{1}{2}$ inch by 2 inches ...	24 feet.	

The table and sliders of the sound-board I assume will be mahogany.

J. B. (*South Shields*).—The "chipping" heard before the larger pipes sound is caused either by the windways being too large, or the upper lips are not quite parallel with the edge of the languid. The Keraulophon may be loud or soft according to your fancy. The chamfers on the languids should be very slight, especially for small pipes. The Stopt Diapason sounds more "breathy" than the Open. The Violoncello, in consequence of the method of making, would give about the same fulness of tone as the Stopt Diapason, but should be more stringy in character.

To A. B. C. (*Haylands*).—I have no time at my disposal to give lessons in organ building. The Post Office Directory will furnish you with the names of all the London firms.

W.J.S. (*Malmesbury*).—The sound-boards which you have purchased would, I think, be best arranged by placing the bass one across the end of the other, thus making the total length 5 ft. 2 in. and the depth 2 ft. 3 in. The bellows may then be made exactly the same size as the one described by me in Part XVI., with either a single or double feeder. Are you not in error in stating that the longest sound-board runs from Tenor C to F, 54 notes—should it not be 42 notes? If it is for 54 notes, it is intended to have an octave-coupler.

N. O. M. C. (*Kilkenny*).—Perhaps the article (in Part XVI.) on the method of making the bellows, will put an end to your difficulty.

Organum.—If you continue the Open Diapason down to C C, as you propose, by

using stopped pipes, you are simply duplicating the Stopt Diapason already provided for, which is quite unnecessary. The Clarabella is an open pipe, and may be constructed like the Flute, but to the same scale as the Stopt Diapason pipes of the same length. The Dulciana is a metal stop, but you might use instead a stop similar to the Flute, but make it about six scales smaller. Reed stops are made of metal, and I cannot advise any amateur to attempt to construct them, as they will cost in the end more than he will have to pay to purchase them ready made, and the chances are that they will be failures after all.

A Grateful Friend, writing from the vicinity of Carmarthen, says—As you seem to attach some value to the testimony of individual subscribers like myself as to the merits of Amateur Work, it would be a grave omission of duty on my part if I failed to let you know what your excellent publication has done for me. Indeed, I feel that I could honestly give you a testimonial of the wonderful kind which we read in the advertisements issued by vendors of patent medicines. For years before its appearance, I suffered from physical debility, mental depression, and low vitality generally. I mean no disrespect to theology when I say that your magazine has wrought in me a sort of bodily and mental regeneration. I have no personal knowledge of any of your contributors, but to several of them I shall owe a deep debt of gratitude while life lasts, and most of all to Mr. Mark Wicks, whose papers on Organ-building have afforded me an amount of pure pleasure which I have very seldom before experienced in the course of an existence that has already passed half the allotted duration. I am sure many other subscribers share my feelings towards Mr. Wicks, and hope that his papers will not soon come to a conclusion.

Coach Building.

J. T. F. (*Brixton*) writes:—I see the above trade is to be introduced in our Journal, providing you can obtain anyone capable of taking it up; but, I say, are we not going ahead a trifle in making this a "hobby" to go in for building carriages and broughams, victorias, and the like? Far be it from me to cold water any proposal that may benefit even a few of our many readers, but I must say I was astonished when I saw the announcement of this subject, and I think it will be news to many of us to hear of the amateur who indulges in the seductive pastime of coach-building for a "hobby." I should like to see the *working plant* of that amateur (who essayed to rival the productions of *Long Acre*), and his coach when built, especially the *wheels* and *varnishing*, and then where would he keep it? but joking apart, Sir, I fear this subject will be beyond the abilities of an amateur as much as the construction would be of a locomotive, thrashing machine, or fire engine. You may not be aware, Sir, that in one most essential part of coach-building, the *varnishing, polishing, enamelling* and *finishing*, is an operation alone reckoned by months, not weeks, and this time is necessary if good and lasting work is to be turned out, and to avoid that bugbear of coach-builders, the "cracking" and blistering of the finish, the beautiful black surface we so much admire, a sure indication of bad and hurried work. Many of the ingredients used, the processes gone through, are shop and trade secrets, and have been in the same hands for years, and of which the men are justly proud and equally chary of imparting to others, and herein would lie the amateur's greatest difficulty after building his "body." Amateur work, as I interpret the definition of it, I take to mean, a man undertakes to make for himself that which he cannot afford, or is unwilling to buy right out at once; granted so much, it means something more than the mere building of it. To make the wheels turn round, a good horse is essential, and I believe money is another necessary to support both, to say nothing of the burden of additional taxes for keeping and running both, and I think it follows, the man who can afford this expense and wishes for coach or carriage, will hardly trouble to rig a workshop, fit it with the necessary plant, which is considerable, and all to make himself *one* coach. I think, Mr. Editor, the odds are he would, with cash in hand, either buy new or secondhand, and hundreds in London every week adopt the latter plan. It's something like the man who attempts to make a glass bottle, the tools would cost him a year's labour to buy to manufacture what he could buy for 4d. Kindly excuse any of my remarks: I write in the interest of all; but should this idea be still entertained, I would, with your permission, suggest where the field for it lies, and that is in the purely rectangular or box system of construction. You may now and then observe driving through London, more particularly the suburbs, neat little pony carts, small traps, dog-carts, to hold two or four, generally two, but constructed wholly upon this principle suggested—that is, the framework is usually of sound ash, beech or oak rigidly interlocked, and firmly bolted together with coach screws and round headed bolts and nuts; the panels for side and front are simply screwed to frame, which is sometimes slotted and panels dropped in; the seat is simply a straight board with piece at back and supported by light ironwork and neatly cushioned if economy be not an object, it slides forwards or backwards on two pieces fixed at sides, perforated with holes into which a pin drops from the seat and holds in position; the back is sometimes hinged to fall down, and so allow any small traps to be put in, in some cases the body is made longer and a seat fixed back to the other, converting it into a trap to hold four. Two wheels, and these can be purchased, I believe, ready made for this class of construction. What ironwork there is is simple in the extreme, being nearly all straight lines, and such as could be made by any amateur of ordinary intelligence in his own kitchen with few and simple tools. The shafts are perfectly straight or nearly so, usually ash, and if constructed for four, should be strengthened with iron where necessary. They are bolted to body of trap underneath. The enclosed sketch—[Thanks for the sketch which I have not considered necessary to engrave.—Ed.]—though rough, will from my description convey to you my idea, and I maintain here is a fine field for those who wish to build their own conveyances. The requisite harness for the above is simple and inexpensive, and no more difficult to construct than boot and shoe making. I must not omit to say the woodwork is highly varnished, ironwork painted black, and heads of screws and bolts outside tipped with a good black, the panels and sides alone offer a wide field for modification in treatment; for instance, they could be darker or lighter according to the framework. Fretwork, basketwork and canework might be introduced, a light iron rail could run round the back and sides. I may add I would willingly undertake the writing of a series of articles, but that I do not understand the relative strengths and dimensions of the various parts in construction, but I offer these few suggestions that should you meet with anyone to take it up I venture be might peruse this communication with advantage to himself and our readers in general. [Our correspondent is sincerely thanked for his letter. It is just the kind of "trap" that he so well describes, or the low basket pony chaise, on which articles are desired. They would be most useful to country readers especially. And it must be remembered that it is not expected that the generality of amateurs should carry out all that is taught or treated in Amateur Work with their own hands. The articles are in some cases rather intended as a guide to those who wish to call the country carpenter, blacksmith, etc., to their assistance. Our readers can fully understand our papers, plans, etc., and by their aid they are enabled to explain clearly what they want to the village artisan, whatever he may be, and thus superintend his work and check any errors he may make in carrying out the job. —Ed.]

Telephones.

R. W. (*Hildenboro, Kent.*)—1. You will not find any economical way to lay your wires underground, and I strongly advise you not to do so if you can help it; for, apart from the extra expense at the commencement, should any fault afterwards occur, you would find it very troublesome and difficult to discover and repair. The cheapest way would be to use thick taped and tarred G. P. wire, which costs about 4d. per yard, but it would not make a good permanent job, and in damp places would soon lose its insulation. If the distance is not very great, I would advise you to purchase ordinary lead water or gas-pipe, and passing the taped wire through it, lay the whole underground in the same way as you would any ordinary water or gas-pipe. 2. With only one "line" wire, you must, to complete the circuit, have an "earth" connection to each battery.

H. J. J. (*Bridlington Quay.*)—1. Not very successfully, unless you added microphones and induction coils. 2. Ordinary galvanized iron telegraph wire, costing about 9d. per dozen yards, or £3 per mile. The supports would, if fixed on buildings, cost about 3s. each complete, but if poles must be employed, the expense would, of course, be more, varying according to locality, etc. 3. Ten or twelve supports to the half mile.

Fret-Saw Blades.

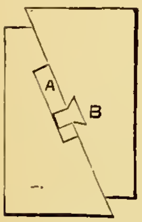
AMATEUR FRET - WORKER. — Griffin's Patent Saw Blades are numbered from 1 to 10, according to size. Nos. 1 to 6 inclusive, are generally sold at 6d. per dozen, Nos. 7 to 10, at 8d. I say *generally*, because different houses sometimes make a slight difference in price.

Music Stand, etc., etc.

F. V.—A supplement is in preparation, which will put you in possession of a design and working-drawing for a music stand. An article on a medical coil, for nerve complaints, is also in preparation, and the first of two articles entitled "How I Built My First Coil," has already appeared. Your suggestions for supplements are duly noted. Addresses of firms who supply empty metallic tubes for oil colours, have been given to other correspondents, in recent parts of AMATEUR WORK.

Improvement in Bench Stop.

A. C. H. (*Brixton*) writes:—Allow me to send you a sketch of a slight improvement (if I may call it so) on the capital bench stop suggested by F. H. L. in a previous Part of AMATEUR WORK. It consists simply of a slip of wood, B, let into one wedge, and a slot A, cut in the other, both slot and slip running the whole width of the stop, so that the accompanying sketch would represent either the front view, the back view, or the section of the stop. This arrangement prevents the wedges from falling apart when they are loosened.



IMPROVEMENT IN BENCH STOP.

Catching Mice.

T. W. (*Clapham*) offers particulars of a simple and effective way of catching mice. He has tried it, and found that several may be caught at a time. Press some bread and butter tightly in the prong of a turned clothes-peg, place it on a plate with the prong covered by a basin, and the edge of the basin resting on the rim, or head of the peg. The little pests will readily go under the basin, and as soon as they begin to nibble, it falls. When you find the trap down, place the plate, etc., in a pail of water, before moving the basin, when you can either drown the intruders, or take them out of the water for the cat, etc. T. W. has known five or six caught this way, in one evening.

"Amateur Work."

A. C. (*Brighton*).—Your suggestions which merit earnest consideration, shall have attention. It is possible that a more frequent appearance of the Magazine, if called for by the majority of its readers, will be contrived, and possibly the general feeling may be ascertained by means of voting-papers. But this will in no way tend to alter the style. I should be sorry to see it altered to that of any weekly publication, with which I am acquainted. These are spoiled by the continual recurrence of the weekly heading, and the close union of the advertisements with the text of the magazine.

INFORMATION SOUGHT.

Hand Bells.

WILLING TO HELP asks:—Will you, or any of your correspondents, kindly give me an address where I can get a catalogue of hand bells?

Transfer Papers.

W. S. (*York*) asks for instructions to make transfer papers, such as are used to transfer patterns on to cloth, satin, etc.

Bench Lathe.

W. H. (*Rosses*) writes:—I have headstock, back poppit rests, flywheel, etc., of a large bench lathe (6 in. centre), and would feel much obliged if you, or any of your readers, would advise me as to the best way of mounting same. Should be grateful for a rough sketch.

Hard Vulcanised India-Rubber.

ROGER (*Swadlincote*) wishes to know whether any readers of AMATEUR WORK can tell him if he has heard of hard vulcanised india-rubber being used for fret-sawing; and if so, where it can be obtained.

Persian Ribbon.

G. E. I. would be much obliged for information how to make "Persian ribbon," as sold at chemists' for fumigating purposes. It is evidently linen tape steeped in some preparation; but what is it? Mere scent burns too quickly, without diffusing the odour.

Geometrical Flower Beds.

A. B. (*East Grinstead*) is referred to the paper on this subject which appears in the present Part.

Punches for Repousse Work.

V. (*Ambleside*) writes:—Please tell me where I can get some punches to do some repoussé work on brass and other metals.

INFORMATION SUPPLIED.

RULES.

1. Write on one side only of the paper.
2. Dispense entirely with the forms of commencing and ending a letter usually adopted, writing at the top of the paper, EDITOR, AMATEUR WORK, and no more.
3. Then write in full the head-line that appears above the paragraph in "Information Sought," to which the reply is given.
4. Next, commence a reply thus:—

A. B. C. (*Hounslow*). or VERAX, etc. [that is, initials of real name and place of residence, or nom-de-plume of writer of reply, as preferred] sends the following reply to R. Q. Z. (*Aldershot*) or HARFAGER [initials and place of residence, or nom-de-plume of applicant, as the case may be.]

5. Lastly, let this commencement be followed by the reply.

A Simple Incubator.

J. T. F. (*Brixton*) writes:—The other day I noticed the annexed advertisement, which appears to meet the wants of D. H. (*Rio de Janeiro*). As it is a question of time, I venture to suggest that D. H. would send over the stamps, if one were posted out to him; perhaps Mr. Currell-Denley would entertain it were you to point it out to him, and possibly contribute us an article or two upon the matter. From this, it seems just the very thing: "Third edition, post free 13 stamps 'Amateur Incubation.' An incubator and rearer for a few shillings. Can be made by any amateur or village mechanic. Easy, simple, perfect, and successful. Full detailed and illustrated instructions. J. Currell-Denley, *Silsoe, Ampthill.*

Cutting Chimney Glass of Lamp.

WILLING TO HELP writes, in reply to L. B.:—To cut the chimney glass of a lamp, take a needleful of darning-cotton, not worsted, dip it in benzoline, wind it round the chimney in a ring, set it on fire, turning the chimney round, then plunge in cold water up to the cotton, the piece will drop off. He had better practise on an old bottle or two, to get the knack, proper heat, etc. The above will also be an answer to C. M. (*Willesden*).

POLITZER writes, in reply to L. B.:—The top of a lamp chimney can be cut with a diamond; but you may have possibly used a steel glass-cutter.

Technical School for Amateurs.

A. K. C. writes:—I notice in "Amateurs in Council" a suggestion for the establishment of a school for amateur mechanics. Perhaps INDUSTRIA and WATCHDOG are not aware of the existence of the workshops at King's College, of which I enclose a prospectus. I have been attending them during the evening during the last three years, and can speak most highly of their efficiency. There is accommodation for thirty or forty students in the carpenters' shop, and for as many more in the metal-work departments. There are between fifteen and twenty lathes, besides planing, slotting, shaping, and drilling machines, worked by steam power. [Any reader desiring further information or prospectus should apply to Mr. DAVID WALKER, *Engineering Workshops, King's College, London, W.C.*—ED.]

THOMAS SYER, of 1, *Finsbury Street, London, E.C.*, writes:—Will you please mention in your next issue, in reply to INDUSTRIA and WATCHDOG, that I intend starting evening classes for amateurs in wood working in all its branches. It will be supplied with all the newest tools, including my registered benches and mitre machines, etc. Any intending students should send in their names to me as soon as possible, as the number will be at present limited. I propose starting in September. [This is well worthy the attention of amateurs residing in and near London.—ED.]

Request for Articles on Special Subjects.

F. A. E. (*Newtownbutler*).—Some of your queries have been already noticed, and several replies are given to one of them in the present Part. With regard to the articles you speak of, there is every desire to gratify your wishes. The difficulty lies in meeting with a practical man, who is both competent and willing to write on the subject mentioned in your letter. Persons have proposed to write on them, but for some reason or other, which is unknown to me, have never sent in even an introductory paper.

Paper Organ Pipes.

J. H. (*Clifton*).—If this correspondent will forward his name and address he can be put in communication with another correspondent, who states that he can supply J. H., with "what he wants, of the very best quality possible."

Cane Bending.

POLITZER writes, in reply to CARLO:—Boil in water for an hour, and then bend to shape, and secure; when cold it will retain it. For a small bend, hold the flame of a spirit lamp to interior of curve until it is turned to dark brown.

Microscopes.

POLITZER begs to inform MICROSCOPICAL STUDENT, that if he will apply to J. Lancaster and Son, Manufacturing Opticians, *Birmingham*, he will get all information.

Nitrate of Silver Stains, etc.

R. A. R. B. (*Oxford*) sends the following reply to F. A. E. (*Newtownbutler*):—Nitrate of silver stains may be removed from linen by washing it first with solution of iodine in iodide of potassium solution, and afterwards washing with water and soaking in sodic hyposulphite. The following liquid is supposed to remove nitrate of silver stains, but I have not tried it:—Iodine, 10 grains; water, 1 oz.; potassic cyanide, 100 grains. Cyanide of potassium is extremely poisonous, and the linen must be well washed after using it.

CATO sends the following reply to F.A.E. (*Newtownbutler*):—Nitrate of silver stains can be readily taken out of linen or any white material without injury with a saturated solution of cyanide of potassium. Simply moisten the stain with the solution, and when the stain has disappeared, wash with soap and hot water. The cyanide is a deadly poison, so be careful not to leave it about.

F. N. E. (*Southport*) writes:—In reply to F. A. E., I have frequently used a mixed solution of cyanide of potassium (10 grains per ounce) and iodine (a few drops) for removing very deep stains from my hands, and on referring to an old volume of the *Photographic News* I find it stated as follows:—"For linen, use the ordinary tincture of iodine, and then dip in a weak solution of cyanide of potassium. If the stain is partly caused by pyrogallic acid, it can be removed by soaking for a few hours in a solution of binoxalate of potash, *i.e.*, salts of sorrel, after applying the iodine and cyanide."

S. W. O. (*Croydon*) writes:—In answer to F. A. E. (*Newtownbutler*), who asks to know how to take silver or iron stains out of linen, I give this formula. Take hydrochloric acid, and dilute it to half its strength, or, better still, chloride of lime in strong solution. Pour a quarter of an ounce of this on the linen, and rub well in till the green stains disappear. Iron stains may still remain of a greenish tint. Rinse the linen, and apply a little dilute solution of potassium oxalate. The linen will be found free from stains. This method avoids the use of potassium cyanide or sodium hyposulphite. Chlorides of the alkalies are sometimes recommended in lieu of hydrochloric acid; they are not so effective. The hydrochloric acid does not discolour the linen permanently. The alkaline solution in many cases restores the tissues to their proper colour. After alkaline development the stains may be got rid of by oxalic acid. I have taken this receipt from "Instruction in Photography," page 300, by Capt. W. De W. Abney.

Ticket Writing.

WILLING TO HELP writes, in reply to F. R. (*Pimlico*). Take a teaspoonful of lampblack, six drops of gold size, equal quantities of oil and turps; thin down to consistency required.

Dissolving India-Rubber.

POLITZER writes, in reply to EXPERIMENTALIST:—To dissolve india-rubber, use bisulphide of carbon.

Bird Organs.

POLITZER writes, in reply to T. D.:—A bird organ may be bought in Bristol for about 30s. These articles are to be found at most music shops.

Polishing Madrepores.

POLITZER writes, in reply to RAMBLER:—These, and all other pebbles, are usually polished upon a lapidary's bench, using emery of various degrees of fineness, and finishing with tripoli. A simple method is said to be as follows: Stretch a piece of cloth or flannel upon a straight board and mix together 2 oz. of tripoli, ¼ oz. nitric acid, ½ oz. ammonia, and ½ pint water, pour a small quantity of the mixture upon board, and rub pebble upon it. But the whole principle of stone polishing is to use abrading matter of varying degrees of fineness until the desired polish is arrived at.

Waterproofing Cloth.

POLITZER writes, in reply to R. W. G.:—For instructions in this matter, see Cassell's Household Guide; but if this is not to be obtained, I will forward an extract from it to the Editor.

Etching on Glass.

J. T. F. (*Brixton*), writes:—ETCHING will find this a ticklish job, and great care must be used with the acids in working. He can try the following on a piece of plain glass first, and if it answers, well and good, if not let him write again and I will send another: this being a recipe I have by me, so cannot speak as to its merits. The glass to be etched should first be heated then coated with an even film of wax or paraffin, melted; soon as set, proceed to etch the design or pattern through it with a fine point or graver. Next obtain or make yourself a shallow lead tray and put in it some floride of calcium (fluor spar), in fine powder, mix to a thin paste with some strong oil of vitriol, and place tray on a warm sand bath, which is a box of sand made hot in the oven, when hot enough it will keep hot for some time after; now place the glass tightly over the tray so that the corroding gas comes in contact with the surface exposed by the lines etched. In ten minutes the design will be etched, the lines being translucent. If desired to make the etching opaque (white), the plate should be wet before exposing it, a little bensole will remove the superfluous wax or paraffin from the glass.

Fret Machines.

J. S. (*Birmingham*) sends the following reply to W. C. (*Alfreton*):—I have a new Rogers fret saw, cost 17s. 6d., has been in constant use about two and a half years, and is still in good condition. Have done a deal of very good work with it, and should recommend you to get one. It will cut ½ inch walnut and mahogany. There is a smaller machine at 13s. 6d.; don't get it—it's too small to be any good. In common with all cheap machines, the saw in the new Rogers' machine describes an arc, and this renders it necessary to be very careful in doing fine work till you get used to it. The first night or two I used the machine I was much disappointed; now I would not be without it. I think that it is the best of all the cheap machines, and is certainly more sightly than the Holly, which is also an American machine. Shall be happy to supply any more information I can if it is of any use.

J. A., jun. (*Croydon*), sends the following reply to W. C. (*Alfreton*):—I beg to recommend for general use for a boy the Windsor fret saw machine, made by the Britannia Company, *Colchester*. The price is the same as that of the Prize Holly, of which W. C. speaks, namely, 17s. 6d. I have had my machine for more than two years in constant work, and it is still as good as new. It can be taken to pieces in three or four minutes, and is so light that it can be carried anywhere.

W. W. (*Woburn*) writes:—In reply to W. C. (*Alfreton*), I have used a new Rogers fret machine for two years, and can highly recommend it. My son, twelve years old, can use it equal to myself, and has made numbers of very difficult articles. I gave 17s. 6d. for mine; I believe they are now cheaper. Can be had from Melhuish & Co., 85 *and* 87, *Fetter Lane*.

F. N. E. (*Southport*) writes:—I think W. C. (*Alfreton*) would be satisfied with the new Roger fret saw, as advertised in this Magazine by C. Churchill & Co. I gave 16s. 6d. for mine in Liverpool, and after fourteen months' use can speak well of it in cutting both hard and soft woods and sheet brass, etc. It is also easily packed when taken to pieces, and although one of the cheapest machines in the market, will, I think, compare favourably with the more expensive ones as regards the work turned out.

J. B. G. (*Longton*) sends the following reply to W. C. (*Alfreton*):—Having had some experience in fret machines, I should recommend the Prize Demas, 35s., which you will get from Harger Bros., *Settle*, *Yorkshire*, or through any ironmonger. The Holly is a good one, but not to be compared with the Prize Demas.

ROGER (*Swadlincote*) sends following reply to W. C. (*Alfreton*):—You cannot do better than get a new Roger fret saw for the purpose you name. It is easy to work, easily understood, and I have never seen better sawing accomplished by any other machine. I do not think the Prize Holly is so suitable for a little boy as a Roger, as the latter is stronger. Also the price of the former exceeds that of the latter. The new Roger is obtainable from Charles Churchill and Co., *Cross Street*, *Finsbury*.

SECOND ENGINEER in reply to W. C. (*Alfreton*) states that he finds the Prize Holly a first-rate machine both for fret and inlaying work.

Ramrod Fixed in Gun Barrel.

SECOND ENGINEER was in same fix as W. H. C. (*Wrotham*), but got out by unscrewing nipple, putting in one drachm of powder, replacing nipple, and firing gun.

Bamboo for Cane Chairs.

J. Fernley, writes:—Bamboo may be bent to any form for ornamental purposes by steaming, or on a small scale by soaking in boiling water till thoroughly pliable. If now bent to required shape and left to dry, it will retain its form.

Polishing Amber Mouthpiece.

J. T. F. (*Brixton*) writes:—I am making enquiries, and hope in a little while to be able to answer C. L. (*Aden*), who asks for instructions how to restore polish on amber mouthpiece.

Gutta Percha Cement.

Politzer writes in reply to J. B.:—Two parts of common black pitch and one of gutta percha, melted in a ladle and well stirred; or dissolve in benzol (not benzoline), oil of turpentine, bisulphide of carbon, or wood naphtha; if wanted thin, add solvent.

Cementing Cork.

Politzer writes, in reply to J. T. F. (*Brixton*):—To do this, use common putty made as thin as glue with japanners' gold size.

Luminous Paint.

J. T. F. (*Brixton*) writes:—For the benefit of I. V. P. The luminous paint can be had from 1s. 6d., from Messrs. Ihlee and Horne, *Aldermanbury*, with full instructions for use in many ways.

Preparing Rabbit and Other Skins.

W. W. R. (*West Kensington Park, W.*) sends the following reply to A. T. (*Lewisham Park*):—Try to obtain fresh skins, if the fur pulls out they are useless. Cut open the skin so as to get at all the fleshy parts, then get some soap-suds or rain water, and well soap them (care being taken in not having water too hot), let them lie for six hours in the water, then well rinse them in clean water, take off all fat and flesh that may adhere to the skin. Then get some bran, and put some in the bottom of a pan, or tub, putting a layer of bran between each skin, then put cold water, till by pressing the bran on top of the skins you can see the water come through, let them stay for two days. Prepare a mixture of 3 parts ground alum and 1 part salt into a paste by adding cold water, and well rub into every part of the skin on the fleshy side, then make a wooden frame, and stretch the skin on it; let it lie, hair downwards, for twelve hours, then go over with the mixture again. Hang up to dry, if possible, where the sun can shine on them. Before they get quite dry, get a piece of pumice stone and well rub the inside of the skin, and you will find that all the fleshy part will peel off, and leave the skin white, and if the pumice stone is persevered with, will be perfectly pliable. If the skin should be an extra hard one, go over with the mixture again, adding a little more water, and finish again with pumice stone. I have nearly a hundred skins made into rugs, which have been in use six years, and they are as good as ever they were. This is my own way of curing them, perhaps some one of the readers of Amateur Work may know of some quicker way. I cannot enlighten you in any other way to make them soft, the principal thing in regard to that, is the stretching on the wooden frame.

Varnish.

E. S. sends the following reply to Young Amateur:—The varnish you require can be supplied by Mr. Samuel Weller, Varnish Maker, 17, *Temple Street, High Wycombe.*

Ticket-Writing Ink.

Politzer writes in reply to F. R.:—The colours should be bought in a dry state at any oil and colour shop. Always get the best, such as vermilion, royal green, ultramarine blue; for the black a good vegetable black will do. Mix your colours with gum; grind them well with a palette knife on a piece of glass or smooth piece of wood or stone. When any of the colours require to be made lighter, add flake white until of the required tint.

Tobacco Pipes.

J. Fernley, writes:—Tobacco pipes are turned in the ordinary foot lathe, the wooden spring chuck, Fig. 1, being used. The wood

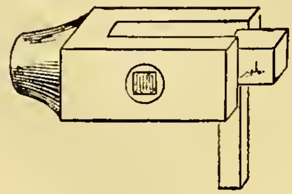


FIG. 1.—WOODEN SPRING CHUCK.

is first out to shape, Fig. 2. This piece is chucked as per sketch, Fig.1, bored out and turned as far as the chuck will allow, it is

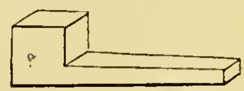


FIG. 2.—WOOD CUT TO SHAPE.

then loosened from chuck, turned round and the stem turned and bored with a half-round bit. It will now have the appearance

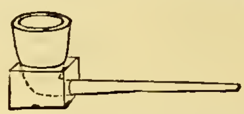


FIG. 3.—PIPE AS TURNED IN LATHE.

of Fig. 3, and is finished by rasping down the square block to the dotted line.

Japanning Tin.

J. Fernley writes:—W. S. (*Loughton*) says that japanning cannot be carried out by amateurs, etc. The following is the way I japanned some tin trays for photographic purposes last week, and the coating has turned out as hard as flint. For black japanning grind up very fine some ivory black with japanners' gold size. Of course enough ivory black should be used to give a sufficient body. The dish or any other article should now be carefully cleaned and thoroughly dried, after which it is warmed before the fire and evenly coated with japan. It is now placed in an ordinary kitchen oven. Those I done were put in the oven in the evening, and in the morning they were quite dry, but not very hard, so I left them in till two o'clock and then took them out, and the coating was now as hard as flint, and glossy.

Polishing Stones.

J. Fernley, writes:—Stones of all kinds are cut and surfaced by revolving discs of copper fed with emery of different degrees of fineness. After a good surface is thus obtained, the final polish is got by revolving discs of lead fed with tripoli or putty powder.

Power for Lathe.

J. Fernley, writes:—In page 139 is described a lathe fitted on a stand similar to that of a sewing-machine. A correspondent asks what form of castings, fittings, etc., are necessary, but he does not say what for. Does he mean for fixing the lathe to the table of a sewing-machine stand? if so, he wants two small standards about 4 inches high to be bolted to lathe bed and also to table. He could not fit a small circular saw to cut 1 inch board, as the flywheel would not be heavy enough to drive it. It requires a considerable power to drive a circular saw to cut 1 inch board.

ANSWERS TO MINOR QUERIES.

K. A. T. Your suggestion shall receive attention.—W. H. R. The papers you ask for will all appear in due course.—J. S. (*Hanley*). Your request has been anticipated, as you will see by the contents of the present Part.—Cornelius Nepos. Engraving on wood and copper will be treated in time. Oleographs are produced by printing in colours.—J. E. R. (*Teddington*). You do not name the subject of the papers to which you refer. I cannot spare the time to inspect your workshop. You should write a description of it yourself.—Impatient. The subject you name is in hand.—E. S. (*Addingham*). An article has appeared on the preparation of slides for the magic lantern. —Banjo. You ask for designs for a gun and two whips. What kind of gun, etc.? Please explain your requirements more fully. At the same time, I may say that gun-making is beyond the province and power of amateurs.—Verax. Your questions are of such a nature that it is impossible to answer them. It depends on your skill, the locality in which you reside, and the demand that exists for the work you mention.—H. H. L. (*Chepstow*). It will be very difficult to get the information you ask for, but it shall be given, if possible.—H. R. Your request shall not be forgotten.—T. H. (*Wolverhampton*). A paper shall be given on the subject you mention, if possible. In such cases as yours, the difficulty lies in meeting with a practical man who is competent to write on the subject named.

Communications from the following are acknowledged, and will be answered in due course. No letter received after the 15th of the current month can be acknowledged. —"North Countrie," J. C. (*Stoke Newington*), F. W. E. (*Southport*), J. W. K. (*Clerkenwell*), W. B. (*Barnsbury*), Justitia, J.W.H. (*Guernsey*), T. N. (*Kilburn*), Amigo, J. B. (*Hereford*), E. A. F. (*Lowestoft*), Harry, H. A. P. (*Glasgow*), India, G. J. M. (*Clapham*), T. L. L. (*Colchester*), E. G. T. (*Plymouth*), Half Jack, E. J. (*Colne*), F. M. (*Gray's Inn Road*). Many other initials, &c., are unavoidably "crowded out" through want of space.

OVERGLAZE PAINTING ON PORCELAIN.

By AURELIO DE VEGA.

IV.—PALETTES—PALETTE KNIVES—PAINTING TABLE—RAG-PROCESSES—THE OUTLINE.

PALETTES.—48. Two or three of these are necessary. They will be used for the reception of the colours when mixed ready for use. When simple monochrome work is in hand, it will be sufficent to use the ordinary slant tile, depicted in Fig. 23. The colour will be placed at the lowest part of the slant, and different gradations can be made in the upper portion, or in adjoining slants, as may be found most convenient.

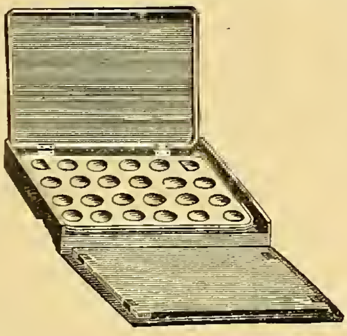


FIG. 25.—SPECIAL TWENTY-FOUR WELL PALETTE WITH GLASS SLAB IN CASE.

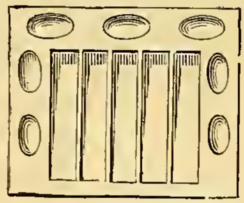


FIG. 24.—COMBINED WELL AND SLANT TILE.

FIG. 23.—ORDINARY SLANT TILE.

FIG. 26.—ORDINARY BALANCE HANDLE PALETTE KNIFE.

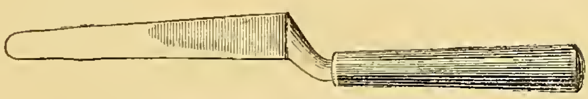


FIG. 27.—TROWEL PALETTE KNIFE.

FIG. 28.—A SKEW BLADE PALETTE KNIFE.

49. A very useful kind of palette, combining both well and slant, is shown in Fig. 24. It is particularly adapted to work in colours ; the prepared colour being deposited in the wells, and worked up in the slants, either alone or in mixture. The larger size is the more convenient, as two of the wells may be appropriated to a little oil and turpentine, or tar oil and spirit, or other medium into which the tip of the pencil will be dipped when "just a touch" more of medium is required at any moment. This plan will be found highly convenient, as it obviates constant recourse to the reserve bottle. Of course, when the water-colour paints are being used, one well will be reserved for *water only*, and one for china megilp, as *no other mediums* but these should be used with such colours.

50. The advanced student, who may be engaged on a work in its second or higher stage, will probably be using a large number of colours at one sitting, and as much trouble and vexatious interruption is saved by having all the colours ready before setting to work, he will find a well tile, of the kind shown in Fig. 25, a most useful adjunct to his working-slants, and one which will meet his amplest requirements. It is by Lechertier, Barbe & Co., is 6 inches by 4, and contains 22 wells and 2 small slants. The price, plain, is 5s., but, as shown, in a tin case, with flap and glass cover to protect the colours, 9s. Any amateur, however, should be able to make a sufficient case of some material for it; or if he makes his own colour box, as I made mine, he will provide for it, as well as for additions of colour bottles.

51. It should be said that, in oil work, the advantage of the well is, that the mixed colour is somewhat less exposed in it than when on the slant, and there is therefore no waste. With the moist water-colour it does not matter, as there is no waste at all with them. The colours may be left on the palette for any length of time, and a little water or a touch of megilp will bring them into working order again.

52. *Prices.* — The plain slants are cheap: 3 divisions, 6d.; 4, 9d.; 5, 1s.; 6, 1s. 3d. The well tiles are dearer ; a 3-well slab is about 1s. 9d., while Fig. 24, 7 wells, is 2s. 6d.

PALETTE KNIVES.

53. *Use.*—Of these, but little requires to be said. With them the mixed colour will be removed from the slab to the palette.

54. *Ivory and Steel.*—At least two will be wanted by the student who is more than a beginner—one of steel, and one of ivory or bone, for use with those colours which would be ruined by any, even the slightest, admixture of iron with them. An old ivory or bone paper-knife makes an excellent palette knife if narrow enough. Care should be taken that no ink is on it, or a steel knife might as well be used ; if it should have any ink stains, these must be carefully *scraped out* and the surface repolished. A very good width is ½ inch. A sharper edge than is generally found in bought knives will be deemed an advantage ; a little fine glass-paper will quickly effect this. As for

steel, there are several shapes made, but the three given in Figs. 26 to 28 will, I should think, satisfy all fancies, while any one of them will meet all requirements. Fig. 27, which is a trowel-shaped arrangement, is extremely convenient to handle, no doubt, but the advantage is more apparent than real. Fig. 28 is made to represent a half-worn-out knife, and is a trifle more pliant towards the point than Fig. 26 ; but this last is very generally useful. Many servants have a knack, when cleaning table-knives, of making the back as sharp as the front; and an old steel dessert-knife, sufficiently thinned down by such a process, makes as good a palette-knife as can be desired. The handle should be a balance one, so that if the knife with wet colour on it be laid down, the colour may not touch anything, and be spoiled ; as to length of blade, about $3\frac{1}{2}$ inches is the best.

55. *Prices.*—The following may be taken as the ordinary range of prices for handles of hard wood ; ivory handles, of course, dearer :—

	3 in.	$3\frac{1}{2}$ in.	4 in.
Fig. 26. Balance.	-/7 to -/11.	-/8 to 1/.	-/10 to 1/.
Fig. 27. Trowel.	2/.	2/1.	1/6 to 2/2.
Fig. 28. Skew blade.	-/8 to 1/2.	-/9 to 1/3.	-/10 to 1/4.

Plain ivory knives from -/10 upwards.

56. *Caution.*—The palette knife should not be used to do duty for the muller in making *mixtures ;* neither is its general employment in working up colours that are to be fired advisable. It will do excellently, however, for mixing up colour that is intended for sketching, or painting on paper, etc.

PAINTING TABLE.

57. *The Leading Points* about the painting table are (1) that it should be solidly constructed, so as to stand quite firm, (2) that it should be suitable in height to the height of the painter, (3) that its area should be sufficient, and suited to afford a convenient place for all the articles he will require in his work, and (4) that it should be placed in a good light. If these are attained, other details which tend to convenience, but are not absolutely necessary, may be passed over to a great extent. At the same time, it is well to know the kind of table at which complete convenience may be had. The following description gives the body of such a one ; the adjuncts being left for further consideration.

58. *Construction.*—The top should be perfectly smooth, so that dust may be easily and completely removed from it. The depth may vary from a minimum of 1 foot 9 inches to 2 foot 3 inches, which will be ample. As to length, we may say *quantum suff.*, but 3 to 4 feet will generally be found enough. A slip of wood standing about $1\frac{1}{2}$ inch above the surface may run round the ends and back, to keep things from falling off, and this can easily be fixed to any table that may be appropriated to the work, by nailing or screwing it to the edges. On the top there should be room for a slope, which may be useful in tile-work, and for a small table-easel behind it ; and at its sides, arranged as may be most convenient, palette, slab, brushes, mediums, lead-pencils, crayons, rag, test-tiles, and other things. It will, I think, be found the best arrangement, to have the first four of these on the right, and the rest on the left. In Fig. 29, I give a plan of a very convenient arrangement. The top should project, or have a projection extending about 3 inches forward beyond the legs. Through this a hole should be bored, towards the right-hand end, and through this hole will pass a bolt, by which will be secured the arm-rest, to be subsequently described. As there is a good deal of leverage on the edge through this arrangement, the top should be about 1 inch thick. The legs should be set very firm, and it is a very good plan to have those at each end bound by a strong piece of wood, and these two tied

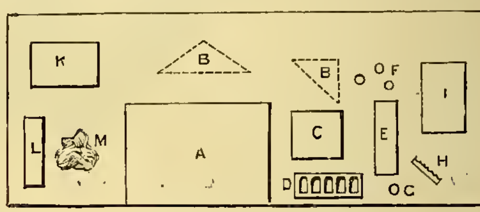


FIG. 29.—PLAN OF TABLE.

A, Slope ; B, Alternative position of easel ; C, Slab ; D, Palette ; E, Brushes ; F, Mediums ; G, Hole for nut ; H, Brush-rest; I, Colour Box; K, Test Tiles; L, Pencils, &c.; M, Rag.

by a cross-tree, which will serve as a foot-rest ; there is nothing like being thoroughly at ease at your work. The table should have a drawer, or drawers, in which to keep all the things required when not actually in use. In fact, they should be the complete store-room for what is in use, and for stock. It will be found an advantage if one of the drawers has a ledge fixed to one side of it. If this ledge has holes made in it with a centre-bit, and a little slab of wood be fitted beneath it, with corresponding depressions in it, the little bottles will be kept safe. The arrangement is similar to that of a stand for chemical test-tubes.

59. *Position of Table.*—As to this, it goes without saying that the correct aspect of an artist's studio is towards the north ; but the reason is perhaps not so widely known. It is simply that the northern light is a diffused light, and direct rays do not fall on the work. So, as long as the painter can secure *diffused* light, and *not direct or reflected* rays, on his work, it is quite a minor consideration from which quarter it comes. One cannot always have it all one's own way, however, so it is necessary to point out that it is important that the painter should not face the source

of light or have it on his right, else inconvenient shadows of the hand and arm would be cast upon the work. Therefore, in any other than a well-diffused or northern light, the light should fall on the painter's left, but in a room facing the north the table may stand with its back to the window.

RAG.

60. *Kind of Rag.*—This, the last to be mentioned, is certainly not the least important of the requisites, for a good painter finds it one of his most useful aids.

The great thing is that it shall not be fluffy. Therefore, do not on any account use cotton rag, which I have seen recommended, although I must think more through thoughtlessness than through want of knowledge. The evil of cotton is that its fibres are always being given off, and these, if they settle on wet paint, draw it up, and they do nearly as much mischief if they get on paint which is still tacky. Linen is free from this objection. Those of my readers who have experience in household matters will understand why windows and glass utensils are cleaned not with cotton cloths, but with "glass" cloths, which are made from flax. New linen is somewhat harsh; the best kind is old linen rag, quite free from lint.

61. *Uses.*—The rag is constantly coming into requisition, and in a good hand is as useful as a brush occasionally more so, for in many cases—particularly those of some kinds of clouds—the rag will pick out the lights and discover the ware in a way that the brush cannot or does not so well. It is often useful also to touch the brush on the rag, and two of the most important brushes—the softeners and dabbers—are cleaned by means of the rag. So that the importance of the rag being lintless is at once apparent.

62. I have now dealt in detail with the several things which are absolutely required by the china painter in the production of a finished picture—that is to say, he must, in order to be able to properly execute a painting, have each of these represented, to however small and limited an extent. These are the articles numbered 1 to 9 in section 12, and the remainder will be taken up gradually at the commencement of each such succeeding paper until they are all disposed of.

PROCESSES.

63. Having now all our general requisites at hand, we are ready to begin work. Before, however, we bring out our brushes and mix our colour, we must decide where the colour is to go when it is mixed. The first concern is the design, and this whether we intend to have a background or not. Therefore, our first operations will be directed towards producing

THE OUTLINE.

64. *Materials.*—According to the method which may be adopted for sketching the outline, there will be required a blacklead pencil, HB or B, lithographic crayon, a tracing point, tracing paper, transfer paper, a pounce, Indian ink, rose pink, or lamp black, and gummed paper or modelling wax. These articles, such of them, that is, as may be required, should be kept in the table drawer.

Prices.

	s.	d.
Tracing Paper (ordinary), 40 inch by 30 inch per sheet	0	4
„ „ Transparent "Végétal," 28 inch by 21 inch (Lechertier, Barbe & Co. . . . per sheet	0	5
Transfer Paper (black, white, or red), 22½ inch by 17 inch . . per sheet	0	4
Ivory Tracing Point . . . . each	1	0
Sketching Crayons, Lithographic . per dozen	0	9

Crayon Holders, each, brass, 2d. and 3d.; nickel, 6d. to 9d.

Indian Ink, 1s. per bottle (liquid); 3d. and 6d. per stick.

Modelling Wax, 6d. per stick.

A word as to some of these will be useful.

(*a.*) *The Lithographic Chalk* is greasy and dirty to handle. To prevent it soiling the fingers, it should have a piece of paper wrapped tightly round it, and gummed down, or be held in a crayon holder. For those who wish to try their hand at making their own chalk, I give the following recipe, taken from "Watt's Dictionary of Chemistry." It is no doubt a good one, but I give it without responsibility:—32 parts beeswax, 4 parts purified tallow, 24 parts soap, 1 part nitrate of potassium, dissolved in 8 parts water, 6 parts lampblack.

(*b.*) A transfer or tracing point, or style (Fig. 30), may be made out of any piece of hard, close-grained wood, such as the handles ordinarily supplied with large barrel pens. It should be regularly and gradually fined down to a point which must be perfectly smooth. The stilettos ladies use in enlarging the holes in their embroidery work answer admirably; or an agate burnishing point is just the thing, and serves a double purpose.

(*c.*) As to *Tracing Paper*, the Végétal paper of Messrs. Lechertier, Barbe & Co. is certainly the finest transparent paper I have ever seen. It lies flat, it is beautifully thin, and for such a paper is remarkably tough; and there is therefore no such waste as occurs in the generality of such paper, which with a crease whitens, loses its transparency on the crease, and cracks. Hence, although it is double the price of the ordinary kind, the economy and satisfaction in using it are an ample compensation.

(*d.*) *Transfer Paper* may readily be made by rubbing one side of unglazed thin paper with raw linseed oil to dampness, and then working into it lamp-black or rose-pink. When it has dried somewhat any excess

of powder can be rubbed off. The bought transfer paper generally errs in this direction : it is too strong and marks too thickly, and requires to be weakened.

(*e.*) *The Pounce* may be anything that will take up a small quantity of powder on its surface ; a little wool rolled into a ball and covered with rag will do, or an infant's quite worn-out puff makes a capital one. It is used to dust colour through the holes of a stencil.

FIG. 30.—TRACING POINT.

FIG. 31.—STICK CUT FOR REMOVING FALSE LINES.

(*f.*) *Indian Ink* should be as good as can be got. The cheaper kinds are anything but pure, and may cause stains ; and as a little goes such a very long way, it is far more satisfactory to get it good at once, in which case it will burn out in the kiln.

(*g.*) *Rose-Pink* is a vegetable colour — *not* the enamel colour. A small quantity can be got at any colour-shop, and will last a long while.

(*h.*) *Lamp-Black* is best obtained by holding a cold plate close down over a lighted good tallow candle, when the chilled smoke is deposited on the under surface of the plate, and must be collected.

65. *Preparation of the Ware.*—Before anything else is done to the ware, it should be washed quite clean and dried. In some of the processes of outlining there is a great advantage in having the difficulty occasioned by the glaze removed. This is effected by covering the ware with a thin film which will take a pencil mark. To do this, mix a few drops each of oil and spirit of turpentine, any excess being on the side of the spirit, and with a rag rub a few drops of this over the ware, *completely* covering it. This coating, which should be as thin as possible, must be allowed to become *thoroughly* dry, when it will be quite firm.

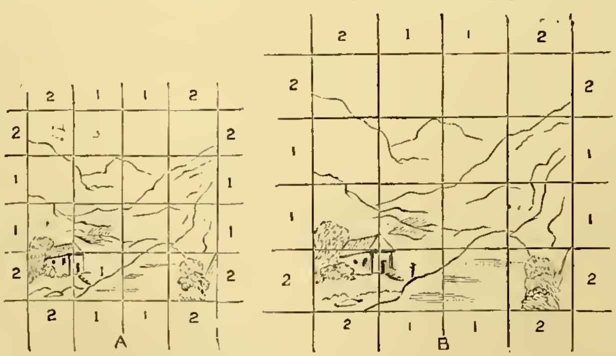


FIG. 32.—DIAGRAM ILLUSTRATING REDUCTION, ETC., BY SQUARES.

66. *Drawing the Outline.* — The capable draughtsman will at once draw his outline directly on the ware without any artificial aids.

(*a.*) Lithographic chalk marks well, if sometimes a trifle thickly, on the glaze, but should it mark unequally, simply prepare the ware, and the difficulty will be overcome. It is rather brittle stuff, so requires to be handled delicately.

(*b.*) *Indian Ink* will also be used on the glaze. It should be rubbed up with water, and the solution should be fairly strong, but not thick. The outline is drawn with a fine camel-hair tracer or pencil, and if the solution were thick the pencil would clog with the evaporation of the water. The great advantage of this is that it is so easily employed and does not wash up with the oil paint, through which it shows clearly.

(*c.*) *Rose-Pink and Lamp-Black.*—These will be used with a tracing-brush. Mix with oil and spirit to the requisite consistency. The tone should not be strong, just sufficiently deep to give a clear outline. Preparation of the ware is unnecessary with these.

(*d.*) *Blacklead Pencil.*—The ware must be prepared and the film hard. The pencil must be handled very lightly, or it will scratch the film, and no mark at all will appear. By this means the minutest details can be put in. This plan is most suited to delicate work, in which very fine outline and much drawing is required. Needless to say, the pencil must be moderately soft—say B—and of first quality. The only objection to this plan (though it decreases as the film hardens) is the liability of the film to wash up and of the outline being lost. Very careful work throughout is required with this.

67. *Tracing the Outline.*—If it is intended to produce on the ware an outline identical in size with that of the copy, the requirements are—tracing and transfer papers, a tracing-point, a blacklead pencil not softer than HB, and some gummed paper or modelling wax. For light ware, the transfer paper will be black or rose ; for dark ware, rose or white. Fix the tracing paper on the copy, and with the blacklead pencil carefully trace over the outline beneath, and the principal features of the interior. Next mark on the plaque, or tile, or the plate, if it has a moulded edge, the top and bottom spots. In a plate or dish there should be ends of a diameter. Plaques are rarely found perfectly rectangular ; therefore, a true rectangle should be described, and the points marked, in which the upper and lower sides are bisected. Similar marks should be made on the tracing, and this should be laid on the ware, so that the corresponding marks on both coincide. A morsel of wax at each corner will keep the tracing in position, or the corners may

be fastened down with gummed paper. A piece of transfer paper, prepared face downwards, is next introduced between the tracing and the ware, so as to be quite under the design. Now, with the style go over every line of the tracing. If this is done carefully a perfect reproduction will be found on the ware.

68. *The Liabilities* in tracing are, either to skip or to duplicate portions of the outline. To ascertain whether either has happened, raise two adjacent corners of the tracing ; if there are any deficiencies, relay the tracing and transfer papers, and supply what is wanting by going over the parts missed. Any unnecessary lines may be removed by a bit of soft wood, such as fire-wood, cut to a fine narrow edge, as in Fig. 31, or by a bit of rag twisted to a point, and damped between the lips. Care must be taken to avoid pressing with the fingers on the transfer paper while this is on the ware, as ugly marks will be produced, which may be awkward to remove without interfering with the outline.

69. *Stencilling.*—This plan is adapted for ware which is more or less convex or concave. Indeed, the time and trouble required in making the stencil would be quite unnecessarily expended in the case of flat ware. First prepare the ware, as above described, and set it to dry. Next make a tracing as before. Now fix a moderately fine needle in a slip of wood, and prick through the outline. This should be done on a cloth, or a few thicknesses of blotting-paper. The reverse side will now look more or less like a nutmeg-grater ; this roughness must be removed, so that the little holes will be cleared ; to do this, rub the back with a flat piece of fine pumice-stone, or with a piece of the finest glass-paper, from which most of the roughness has been removed by rubbing against another. The holes being clear, the stencil is ready. It will be evident that the holes must be as close together as is practicable, but they must be quite separate and distinct, or they would run together in the rubbing, and the stencil fall to pieces. The stencil must be fixed to the ware by wax, at one or more points near the centre, so that the edges may be free to move. Dry powder (rose, pink, or lamp-black) is now dusted over the stencil, and the outline appears on the prepared ware in a succession of dots ; this dotted outline should then be fixed by going over it with the tracer and a little colour. It may be necessary to vary the *point d'appui* of the stencil in work more than very slightly out of the plane ; in such case, judgment will have to be exercised as to the points and extent of the inevitable deviation from the copy.

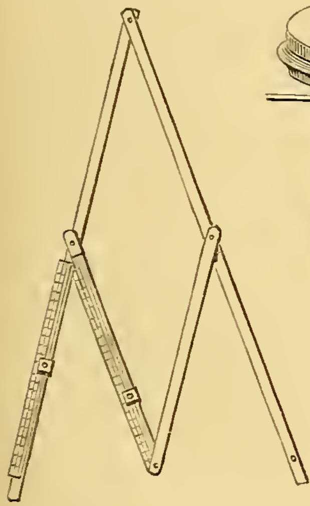


FIG. 33.—PANTOGRAPH.

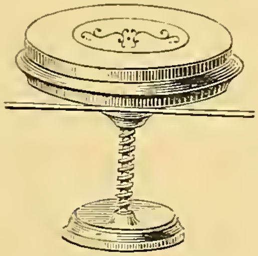


FIG. 35.—ELASTIC PANTOGRAPH.

FIG. 34.—DIAGRAM SHOWING METHOD OF USING PANTOGRAPH.

70. *Enlargement and Reduction.*—The student may often wish to enlarge or reduce his work, to meet the exigencies of his ware. I give three plans for doing this.

(*a.*) *The System of Squares.*—Through the centre-point of the copy and the plaque, draw two straight lines cutting each other at right angles ; point off from the centre, equal parts along each line, and through the points on either line draw lines parallel to the other. Divide the lines on the plaque into the *same number* of equal parts, which will be greater or less in size as the tile is greater or less than the copy, and complete the squares ; then in each square on the tile is to be reproduced what is in the corresponding square of the copy. An eye to proportion is what is most required here. If the outline cross a line of a square at a quarter, or third, or half of its length, so must the new outline also. For illustration, see Fig. 32, A and B. The troublesome part of this is that, when

the outline is finished, all the scaffolding must be removed, or it might show in the fired work, through having collected paint.

(*b*.) *Pantograph*.—Fig. 33 (Pantograph Simplifié ; Lechertier, Barbe & Co.). This very simple contrivance consists of four slips of wood fastened together as shown in the Fig. The cheaper example has holes pierced in the left long arm, and corresponding ones in the left short arm. The better kind has a graduated slit in each of the two arms, so that the number of proportions producible is increased. The accessories are a pivot, with two teeth for fixing in the table, a pencil or sketching crayon, a sliding nut, and a dry point. The copy and paper, or plaque, are firmly fixed to the table with drawing pins or wax. When it is desired to enlarge, the pivot is placed to the left, the dry point in the middle, and the pencil to the right. To reduce, the pivot is placed to the left, the pencil in the middle, and the dry point to the right. The dry point is then run over the outline, the reduction is produced by the pencil or chalk on the paper or plaque. The extent of reduction or enlargement is determined by the position occupied on the scale by the sliding nuts carrying the pivot and pencil, or dry point, whose positions must always correspond. This aid is sufficiently exact for all practical purposes, and the *emploi* is shown in Fig. 34. Prices: plain, 2s. 9d.; with sliding scale, 5s.; best-make, 21s.

(*c*.) *Guerin's Circular Elastic Pantograph* (Fig. 35). —This is an expensive arrangement, but it is absolutely perfect in its enlargement or reduction. The principle is simple : a sheet of indiarubber, in the centre of which is a circular piece of special make, is fastened over a drum, the whole being air-tight. With a Conté crayon, or the special ink sold (acid and grease injure the rubber), make a drawing on paper. To reduce, turn the handle from right to left, so as to draw down the rubber, extending the central portion. Now place the drawing down on the rubber, and rub this slightly, so as to transfer it ; then reverse the handle, and the rubber will contract, and the drawing decrease in size. To enlarge, the process is reversed. The rubber is cleaned with a sponge and clean water.

Prices for drawings 8 inches diameter		£1 10 0
" " $12\frac{1}{2}$ "	"	3 10 0

In the next paper we shall consider some further apparatus, see how to mix colour, and take a simple subject in hand. In the meantime, sufficient has been said to enable anyone who intends to set to work steadily under my directions to get together all the appliances and apparatus that he will require for properly carrying out the task that he is about to take in hand.

(*To be continued.*)

HOW TO MAKE PICTURE FRAMES.

By H. MILLBROOK.

II.—OXFORD FRAMES.

SINCE my first article on picture frames was written, I have had an opportunity of seeing the corner cramp and mitre-cutting machine manufactured by Booth Brothers, of Dublin. With regard to the former, I must say that these clamps are likely to prove very serviceable to the amateur, as the moulding can be held firmly, and there is not so much danger of the joint slipping when driving home the nails as there is when an ordinary vice is used. The vice will, of course, prove the more useful of the two where only an occasional frame is made, as it is available for so many of the odd jobs executed by most amateurs.

The mitre-cutting machine is also most useful, as it saves time and cuts the mitre at one stroke, clean and true, rendering planing, etc., unnecessary. The price, too, is moderate ; and, where a number of frames are intended to be made, I should advise the amateur by all means to invest in both corner cramps and a mitre-cutting machine.

Oxford frames are, perhaps, the most useful and artistic of all frames, and the best of all for general purposes. Photographs of scenery, engravings, etc., always look well when in an Oxford frame. Then, too, these frames can either be carved, if the amateur is skilful enough, or they can be gilded, or simply stained, oiled, or polished. Any kind of wood is suitable for making them—walnut, oak, or mahogany; but oak is almost invariably used for the purpose. I will now give instructions for making Oxford frames. First of all, a few more tools are required, but these are easily obtained. I will suppose the amateur to have a saw, a couple of planes (a jack and a trying plane), an iron square, and a cutting gauge. In addition to these, he will require a parting or V-tool, and a firmer chisel $\frac{3}{4}$ in. wide (Figs. 4 and 5).

Now for the wood. The oak—and I prefer oak for these frames—is what is termed "stave oak," and not English oak, the latter, however useful it may be for many purposes, being too tough and cross-grained for our purpose. Stave oak can be obtained from almost any timber-merchant, either in staves or in planks of various thickness.

The ordinary Oxford frames are made in great quantities by machinery, and are turned out at a very cheap rate. The great failing of these machine-made frames is that they are never, or at least very rarely, properly finished off. In a medium sized frame the plank of oak should be 1 in. thick, and this should be swan into strips $\frac{3}{4}$ in. wide. The next thing to do

will be to cut these strips to the requisite length, taking care to leave them a trifle longer than necessary, so as to allow for finishing off when the frame is completed. In the case of a frame required for a picture, say 12 in. long by 10 in. wide, the length of these strips should be: the top and bottom strips 17 in. and the sides 15 in. in length. The pieces of oak should now be planed on two sides, or rather on the front and one side, and carefully squared; then, by means of the cutting-gauge, which should be set to the proper width, the remaining sides are similarly planed and squared. In the planing the jack-plane is first used, and the wood is finished off by means either of the trying-plane or an iron plane.

After these strips are properly planed and squared, the next proceeding is to mark off the inside size of the frame, and this is done by placing the sides together and marking both at the same time, by means of the square and a scriber, the top and bottom being marked off in a similar manner.

The next thing to do is to put the frame together, and in doing this we must be careful to make the pieces fit very closely at the joints. First of all, take the piece of wood intended for the top of the frame, and at each end, and *outside* of the previously drawn line draw a second line at a distance exactly equal to the width of the strip of wood intended for the side, the bottom piece being marked in a similar way. The object of this will be seen by referring to Figs. 6 and 7, where the corner of the frame is represented. The sides of the frame are marked in the same way, only from the *back* of the frame instead of from the front. When this is done, a tenon or back-saw is used, and the top is sawn half through at the marks, as at A, the piece of waste wood being cut out with a chisel; and in sawing this great care must be taken not to saw more than half way through the strip, and to saw rather *inside* than *outside* the lines, as if the slot is not wide enough it can easily be enlarged with the firmer chisel so as to fit exactly into B. When these joints are properly made the front of A is exactly flush with the front of B, and B fits tightly into A. Of course, the same process is gone through at the other corners of the frame, and the frame should now be put together to see that it is all right. We may now consider that the first stage is completed, and turn our attention to the second. The frame must be taken to pieces again and the "rabbet" cut out. The rabbet lines are marked from the joints of the frame only, and, of course, marked from the back. In this case the rabbet line should be ⅝ in. from the front of the frame, and about the same distance from the back. This is shown at Fig. 8, which is a section of the frame; and Fig. 9 shows a corner of the frame as it appears when seen from the back, and from this it will be noticed that the rabbet only extends from joint to joint, and therefore it cannot be made with the plane, but must be cut out with the parting tool and chisel. Here again recourse must be had to the cutting-gauge for marking the lines required for the rabbet. When these lines have been marked, take the parting tool and work it along inside the lines left by the gauge, and cut away the waste wood, and form the rabbet with the firmer chisel. Care should be taken to make that part of the rabbet nearest the front of the frame perfectly straight and level, as any inequality will tend to make the glass and picture lie unevenly, and thus spoil the effect of the frame. With the back of the rabbet, which is never seen, so much care need not be taken. Amateurs will find it rather difficult to hold the pieces of the frame firmly whilst cutting the rabbet. I generally find it better to fix each piece securely in the vice, or else to use a couple of bench-screws, one at each end. Having completed the rabbet satisfactorily, the next process will be to cut the pieces to the exact length. In a frame of this size, the projecting ends should extend about 1¾ in. beyond the outside of the joints, and in marking and cutting the pieces of the frame it is advisable to cut the two sides and the top and bottom by placing them together, and so ensure accuracy. After this is done the frame has to be chamfered, and to do this properly we first of all mark off the width of the intended chamfer; the width is merely a matter of taste, but in a frame of medium size it should not exceed ¼ in.—that is, ¼ in. each way. When carefully marked off, the wood is taken away with the firmer chisel, and before commencing see that the chisel has a keen edge, otherwise a slight slip of the tool may do much to spoil the frame. Too much care cannot be taken in making this chamfer. Keep the lines perfectly straight and even and sharp. Although scraper and sand-paper are frequently used in finishing an Oxford frame, I do not recommend their use; in fact, I strongly disapprove of both, as not only do they destroy the sharp appearance of the work, but they tend to make the amateur careless. He fancies that any slight inequality of surface can easily be rectified by the use of a little sand-paper, and consequently his work always has a slovenly appearance. Fig. 10 shows how an Oxford frame should look when properly chamfered and finished. It is customary to put in a black nail at each corner, to give a finish to the frame; but a better plan is to make a few black pateras out of ebony, as these look much neater, and are better in every respect. I give a sketch of two pateras in Figs. 11 and 12.

The amateur can now put his frame together, and if well made he will only require to touch slightly the joints with thin glue and drive them firmly home. If any inequality appears on the frame, or if the sides are

not quite flush, the plane must be used to rectify the mistake. Brads or nails are not required, or should not be required ; but if the joint does not appear quite tight, a cut-joining brad or two may be used. After the glue at the joints is dry, the black pateras can be put on at the corners, and the frame may be then reckoned as finished, the only thing required being a rub over with a little boiled linseed oil. Should a dark stain be required, to give the frame an "old oak" appearance, dissolve half-an-ounce of bichromate of potass in six ounces of water, and apply with a brush or rag to the frame, and when dry oil with boiled linseed oil. How to fit up the frame I described in my last article.

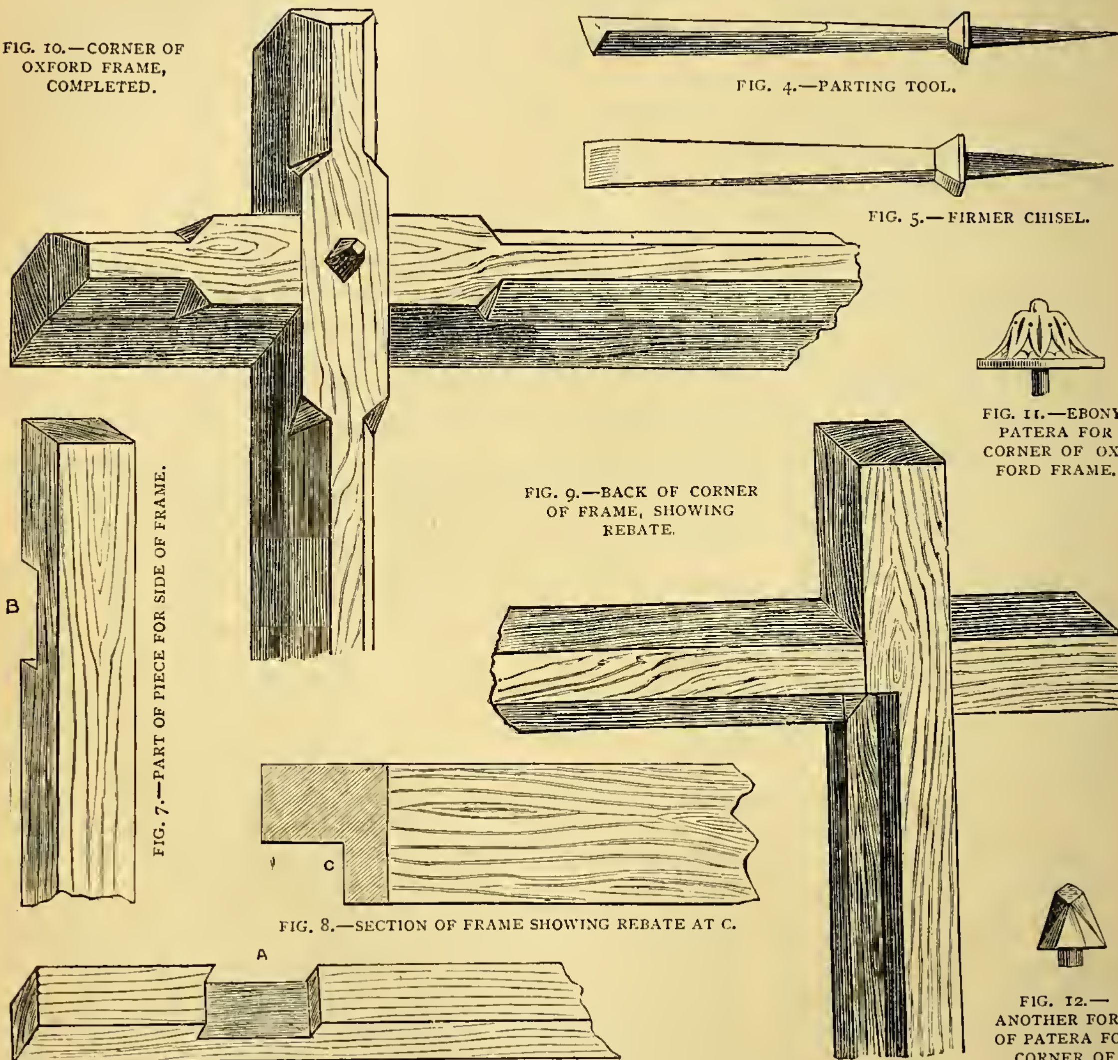


FIG. 10.—CORNER OF OXFORD FRAME, COMPLETED.

FIG. 4.—PARTING TOOL.

FIG. 5.—FIRMER CHISEL.

FIG. 11.—EBONY PATERA FOR CORNER OF OXFORD FRAME.

FIG. 7.—PART OF PIECE FOR SIDE OF FRAME.

FIG. 9.—BACK OF CORNER OF FRAME, SHOWING REBATE.

FIG. 8.—SECTION OF FRAME SHOWING REBATE AT C.

FIG. 6.—PART OF CROSS-PIECE FORMING TOP OR BOTTOM OF FRAME.

FIG. 12.—ANOTHER FORM OF PATERA FOR CORNER OF FRAME.

I have seen Oxford frames made out of the ordinary gilt moulding ; but I would not advise any amateur to make Oxford frames of that material, as, owing to the rabbet of the moulding being carried through, the ends of the frame have a very unfinished appearance. Should the amateur want a gilt Oxford frame, let him make one of oak, and then gild it himself, or get it gilded, *on the wood*. By doing this the grain of the wood appears through the gold, and gives an artistic look to the frame.

My next article will be devoted to novelties in picture frames, including cork frames and frames in white and gold.

(*To be continued.*)

A PLANING MACHINE FOR AMATEURS.

By A. J. WALLIS-TAYLER, C.E., A.I.M.E.

A MACHINE of this class, within the compass of amateurs, is shown in Fig. 28, which represents a small patent planing machine with fixed cutter, recently brought out by Mr. Hazeland, and manufactured by Mr. W. B. Haigh, engineer, *Globe Iron Works, Hill Street, Oldham.* It is adapted to the wants of amateurs in so much as it requires comparatively little power to drive, a moderate degree of speed being sufficient—some three hundred revolutions per minute—and also from the fact that it might be easily arranged to drive by hand-power, if desired. The price, considering the general finish of the machine, is not high. That of a machine complete, as shown in the sketch, to plane three inches in width by any length in reason, and supplied with two knife-boxes, each fitted with a knife, so that one can be sharpened whilst the other is in use, is £12 10s. at works. A larger machine is also made to plane stuff up to nine inches in width.

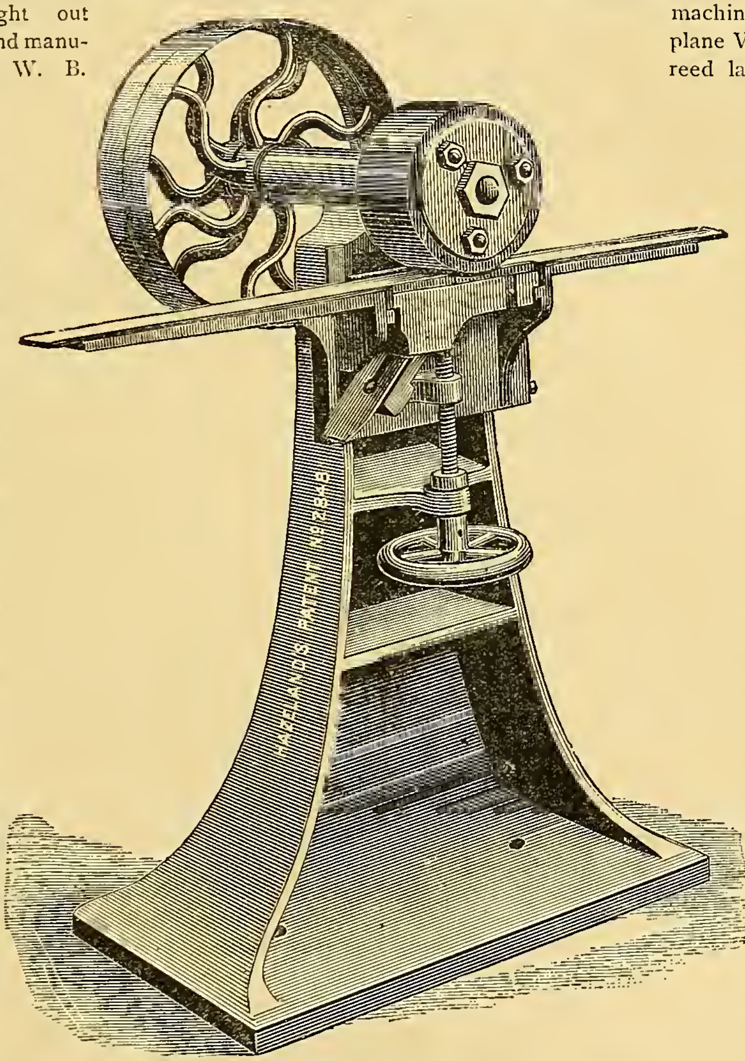


FIG. 28.—SMALL PLANING MACHINE. HAZELAND'S PATENT.

As can be seen by glancing at the illustration, the work is performed by means of a stationary knife, fixed in a box, and fitted in a cast-iron table 3 feet 2 inches in length. The surface of this table is planed perfectly true, and is so arranged that it can be raised or lowered by a hand-wheel and screw, so as to suit the various thicknesses of the work required to be planed. A roller of large diameter made of india-rubber feeds the work to be planed up to and past the cutter. The diameter of the driving pulley is 15 in. by 3 in., and the power required to drive the machine is about a quarter-horse power, so that it could be worked easily by any one possessed of a small gas engine. This machine is also adapted to plane Venetian blind laths, reed laths, etc., and would be found a very useful tool for organ building, and many other descriptions of work.

Should it be desired to work the machine by hand-power, the best method to adopt would be to erect a counter-shaft, fitted with a fly-wheel of about 6-ft. diameter, arranged with handles to turn by hand, and drive direct on to the pulleys of the machine, the distance from centre to centre should not be less than fifteen feet; short centres necessitating the tightening of the belt to an injurious degree to avoid slip, and producing increased friction, liability to heat, and, as a natural consequence, taking up more power to drive; too long centres, on the other hand, are equally to be avoided, owing to the sag imparted to the belt. The fly-wheel may be either made of cast iron and turned on the rim, or else built up of wood. This latter plan would be the most advisable for an amateur to adopt, as he could knock one together himself at a comparatively trifling cost, and would be foolish to go to the expense of a cast iron fly-wheel where a wooden one would do as well.

THE ART OF PAINTING ON THE PHOTOGRAPHIC IMAGE.

By JOSEPH WAKE.

III.—ALTERATIONS AND IMPROVEMENTS—TREATMENT OF SHADOWS—CONTRASTS—LIGHT AND SHADE IN BACKGROUNDS.

AS regards the latitude allowed to the artist in the way of alterations or improvements, there has been much difference of opinion; but no doubt the photograph can be much improved upon without absolute flattery, although sometimes a little of the latter may be fairly allowed. The friends of a person accustomed to see them in the ordinary light of a room animated by conversation, form a very different *impression* of them than that which they get from a sitting in a photographer's studio, with its top-side-light, and with the subject stuck in a vice, looking at some fixed point, with a one-eyed camera staring at them, of which I have heard young ladies say positively that "it hurts." To begin at the top of the head, the parting of the hair is generally too wide and too white, narrow it and tone it down with the grey shadow colour; the lights on the hair are frequently too light, tone them down; grey hair almost always comes out whiter than that of the sitter, not an agreeable exaggeration. There are many shades of white hair, some being creamy, others cooler; creamy white hair can be often well represented by a general light wash of sepia, afterwards putting on the lights with white and Roman ochre. Silvery hair may be painted with different proportions of the grey shadow colour. Paint the hair in masses, especially women's hair, and then if it looks too stiff or smooth break it up here and there with a dark stroke in the light, or a light (body-colour) stroke in the dark, not with pure white but white slightly tinged with burnt sienna. Keep the deep shadows warm, and the lights cool, the real colour of the hair only appears in the half tones.

Now examine the forehead. If there are the wrinkles of old age there do not remove them, although it will often be only fair to the original to soften and lighten them, for they are often cruelly emphasized by the photographic picture, so are the "crow's feet" at the corners of the eye. If the eyes have a pained expression, as is often the case, it is almost always caused by an involuntary drawing up of the eyebrows at the inner extremities next to the nose; that should be altered by cutting off the contracted part and restoring the proper arch of the eyebrow as it should be when at rest. There is a variety of eye sometimes seen in which instead of the upper eyelid being visible along its whole extent, it is covered in the middle portion by a kind of bag of flesh hanging over it, and this often gives a kind of cute look often very agreeable; attend to this, and do not attempt to remove it as so many colourists do to the entire detriment of the likeness. A delicate grey tint should almost always run down the light side of the nose next the cheek, but avoid making this too dark or a dirty appearance is produced. If the dark line running from the nose to the corner of the mouth be too dark in an autotype or argento bromide print, it should be gently scraped down with a very sharp knife, and a very light touch; if a silver print it should be warmed and lightened with a little white mixed with some warm colour, say orange chrome, as scratching would ruin it. Be very careful about the shape of the mouth, tint the upper lip with Indian red, and the under with rose madder and vermilion, shading it off with grey at the shadow side; do not let the shadow under the lower lip remain black, nor the dimples at the corners of the mouth; warm up also the black shadow under the chin, and if the shadows down the shadow side of the face be very strong, the collar and linen on that side must be boldly darkened with almost any grey colour, but a wash of lamp-black with a touch of gamboge makes a capital colour, or any one of the pearly shadow colours can be used if put on boldly and strongly enough. But do not be disappointed if you cannot get this on even, most probably you will not, but let it dry and then stipple it.

This darkening of the whites on the shadow side is a most important matter in a finished picture: firstly, because photographs rarely give the shadows in white; and, secondly, because if it is firmly done, it will often by contrast make the shadow side look lighter and more luminous. Nothing looks more hideous than to see one side of a face dark, and the other light, with a collar staring white on both sides, and this leads me to speak more of what can be done by contrast. Should a photograph be faint and weak, do not put too dark a background, keep the whole thing in the same low pitch, so to speak; then again with colours, suppose you have a subject with a very red face, you must paint him as red as he is, or nearly so, but by the introduction of something red, say a curtain in the background, it will be somewhat toned down by contrast, and yet look like him. Again, it is often unavoidable, especially in a photograph brought to you, and not arranged by yourself, that there will be some object that requires painting too bright to be pleasing in the composition. This may be kept quiet and painted lower in tone, if you repeat the same colour somewhere else in the picture, very much lower in tone still by the admixture of black or some other colour, keeping it at the same time rather fainter.

The whole question of contrast is too lengthy to enter into in these papers, but I will just say a few more words on it: purple will force, that is, increase the brilliancy of orange; red, of green; blue, of yellow, and so on; and all these things should be thought of in choosing the tint, or tints of your background. Things in sunlight, look different from things in shadow, and if sunlight and shadow come side by side, the contrast is often somewhat startling to the observant eye. To take a familiar example, observe a yellow gravel walk on a sunny day, with shadows of objects thrown across it, the cast shadows will look quite purple, and the lights a golden yellow, but let the sun be obscured by a cloud, the walk will not look all purple, because the contrast of the spots of sunlight are wanting.

In arranging the light and shade in a background, I think, as a rule, it is better to make it darkish against the light side of the face, and light against the dark side of the face, although I am aware there are some very high authorities for an opposite system; but most portrait painters adopt the rule I here give, unless, like the modern school, who more or less follow Mr. Ouless, you make the entire background one deep flat almost black colour, this however would be troublesome in water colour, but is worth bearing in mind, because its very flatness and darkness seem to help both the colour and modelling, as seen in the perfectly marvellous work of that gentleman, in his portraits in oil from nature, and of which I have the privilege of examining many that come to be copied by the autotype process. A good generally safe and useful tint for a background, may be made of French blue and sepia, darkened down at the bottom corners of the picture with pure sepia, enriched perhaps in the deepest part with a little burnt umber; this should be washed on, using plenty of gum, and then stippled up with the same mixture, or one slightly allied to it, but different. This stippling with a third colour has often a charming effect, but in the hands of an amateur it is difficult to prevent the colouring getting patchy. Should some part dry too blue, even it up with sepia, or if too brown with the blue. If it be desired to fill up a large bare-looking background, a curtain or panel may be introduced, but not too conspicuously, and let the panel, or dado, or both, be rather suggested than otherwise; do not let it run all the way in the same light and shade, but loose it almost here and there. A panel may be traced out lightly with yellow ochre, burnt umber, and a touch of white, and then here and there a glint of light, composed of Roman ochre and white, this represents a gold ornamental panel, and may have a sketchy scroll indicated at the corner.

(*To be continued.*)

METAL SPINNING FOR AMATEURS.

By JAMES FERNLEY.

METAL spinning is the art by which sheet metals are shaped whilst revolving in the lathe, this shaping being done by the pressure of burnishers of different shapes.

It has always been a wonder to me, why amateur mechanics, who generally know a little of everything, should know so little of this most useful art. Its great recommendations are simplicity and quickness, with which the work is done, and the few and inexpensive tools required. Any amateur possessed of a lathe, and a fair knowledge of turning can spin (shape) sheet metals to any pattern that can be turned. With this slight introduction to my subject, and before starting the actual work, I will just give a list of the few tools required.

I have already mentioned that a lathe is necessary, and as the amateur will not get a lathe on purpose for metal spinning, he will have to use the lathe he has got. A good deal of work can be done on a strong $4\frac{1}{2}$ in. lathe, but on smaller sizes (3 in. or $3\frac{1}{2}$ in.) only the softer metals, such as Britannia metal, lead, or zinc, can be spun, unless the articles are of small diameter, then copper, brass, or silver could be used; but had I to choose the most handy size for such work, I should say a strong $5\frac{1}{2}$ in. or 6 in. lathe, with heavy fly-wheel, would be the best.

Besides the lathe, the other tools are few. Before spinning the metals, a pattern is always made to work on, therefore wood-turning tools and chucks are necessary. Fig. 1 represents the screw chuck; Fig. 2, the prong or fork chuck; Fig. 3 is a small face plate, the face of which is turned so as to leave a roughish surface, this rough surface is to more easily take the composition for cementing blocks of wood on. The face is also drilled with several holes for fixing the work on, by means of ordinary wood screws.

As all lathes ought to be possessed of these chucks for ordinary wood turning, we cannot count them as an expense to be entailed exclusively for the purpose ef spinning metals; but we now come to the actual tools by which the work is shaped. These tools are represented in Figs. 4, 5, and 6; they are steel burnishers of the shape shown. Fig. 4, round nose; Fig. 5, flat; and Fig. 6, horn-shaped. These three burnishers are sufficient to do a lot of work with, but other shapes will suggest themselves to you while working. They are all made of $\frac{3}{8}$ square steel, about 6 in. long outside handle, and the handle itself about 9 in. long, they should be well hardened and polished. These sizes are for work that would be done in a 5 or 6 in. lathe, but for smaller lathes the size of ordinary turning tools would be sufficient.

The T-rest, Fig. 7, differs a little from the ordinary turning rest, inasmuch as it is drilled on top with several holes. Into one of these holes a steel peg is put, to act as the fulcrum in using the burnishers, and it is moved from hole to hole as the work advances.

Having now described the necessary tools, we will look for some work. Let us take for instance a plain box, such as represented in Fig. 8. This is a very simple piece of work, and, to give all the advantages we can to the learner, let us make it of Britannia metal, or the more easily obtainable sheet lead.

We will suppose, for instance, that the body of the box is 1½ in. in diameter, and 2 in. deep inside, with dome lid. The pattern being the first thing to make, let us take a piece of wood of suitable size, screw it on to the chuck, and turn a cylinder with flat end. This being done, we cut a circular piece of sheet lead about 4½ in. diameter, place this against the end of the pattern, and bring up the back centre. A centre piece A, Fig. 9, should be placed between the back centre and the work, also the ordinary turning centre of 60° should be replaced by one of the shape represented in Fig. 10.

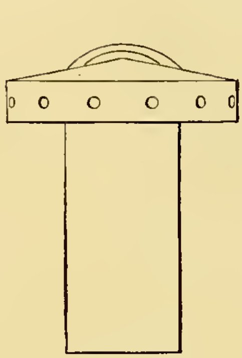


FIG. 7.—T REST.

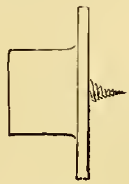


FIG. 1.—SCREW CHUCK.

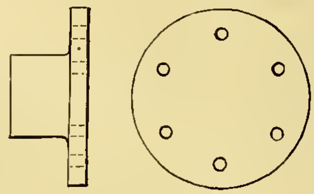


FIG. 3.—SMALL FACE PLATE.

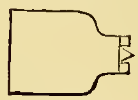


FIG. 2.—FORK CHUCK.

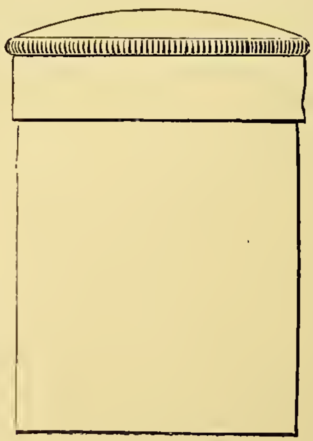


FIG. 8.—PLAIN BOX.

FIG. 4. ROUND NOSE BURNISHER.

FIG. 5. FLAT BURNISHER.

FIG. 6. HORN-SHAPED BURNISHER.

Now place the T-rest in position as if for ordinary turning; take burnisher No. 6, and with a sweep from right to left, press the metal towards the pattern B Fig. 9, just as if you were moulding clay. The next stroke should be taken the reverse way. The reason for this is that, if all the strokes were taken in one direction, the metal would be considerably thinned by the time the work was finished.

Fig. 11 represents, much exaggerated, the action of the burnisher during the two strokes. During the first stroke you will see that the metal at A is piled up by the burnisher. The second stroke, as at B, spreads back this accumulation of metal over the partly thinned surface, and thus brings it back to its origina thickness. A few strokes will suffice to bring the lead to bear on the sides of the pattern, it is then smoothed with burnisher (Fig. 5). The top edge is now turned off with an ordinary turning tool, and the body of the box is finished.

Now comes the lid. This must have a pattern made for it. Fig. 12 represents the pattern. A piece of sheet lead of suitable size is placed against it, and the centre piece placed between the back centre and the work, the lathe is set going, and the burnisher used to press the metal against the pattern. We will suppose we want a bead around the edge of the lid. To make this the strokes of the burnisher should be all from the centre to circumference; this will accumulate the metal at the edge A, Fig. 12; also in working down the sides the strokes should all be from left to right.

We now work this accumulation of metal to the form of a semicircular bead, and mill it with milling tool, Fig. 13.

Our box is now finished, it may be lacquered with a coloured lacquer, and a few bright rings turned on it to suit fancy; this gives it a very pretty appearance, and is not troublesome to do.

My amateur friend having succeeded in making this box, will have mastered the first principles of metal spinning, and he should try his hand on some of the harder metals, such as soft brass, copper, silver, etc. Copper, from its ductility, is a pleasant metal to spin, but together with brass and silver it requires annealing when it gets hard and untractable. To anneal take it from the pattern and put it in a bright fire, when red hot take it out and drop it in cold water. This will soften it, and cause it to work pleasantly.

The surface of these last mentioned metals should

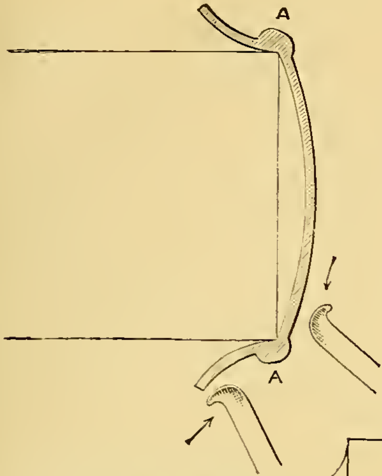


FIG. 12.—DIAGRAM SHOWING METHOD OF MAKING LID.

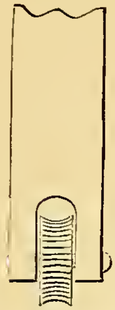


FIG. 13.—METHOD OF WORKING AND MILLING BEAD.

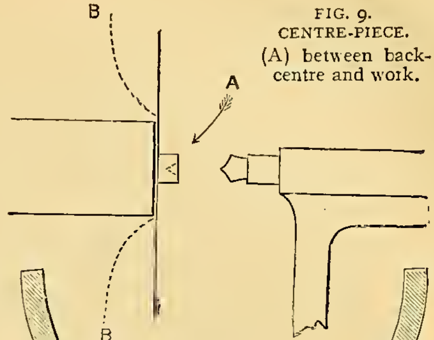


FIG. 9. CENTRE-PIECE. (A) between back-centre and work.

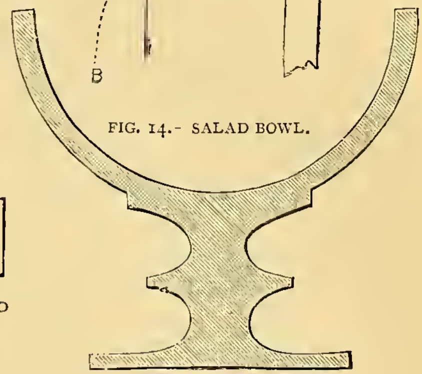


FIG. 14.- SALAD BOWL.

FIG. 10.—CENTRE TO BE USED INSTEAD OF ORDINARY TURNING CENTRE.

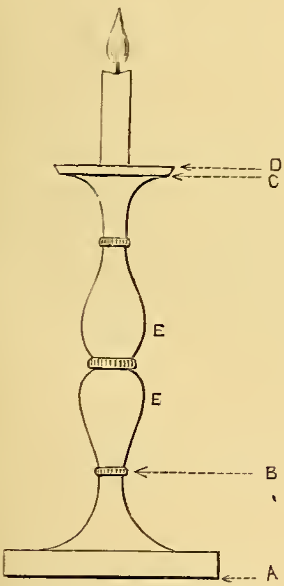


FIG. 15.—CANDLESTICK.

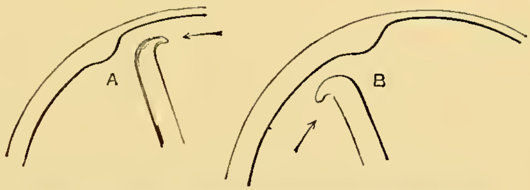


FIG. 11.—DIAGRAMS SHOWING ACTION OF BURNISHER.

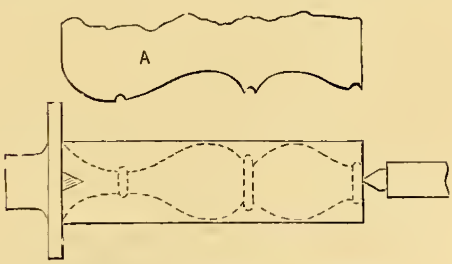


FIG. 16.—TEMPLATE FOR CANDLESTICK.

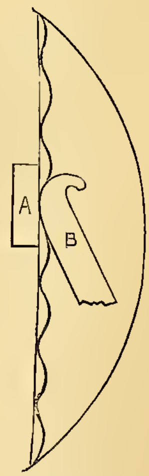


FIG. 17.—EXAMPLE OF BUCKLING IN CONCAVE MIRROR.

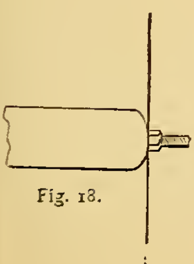


Fig. 18.

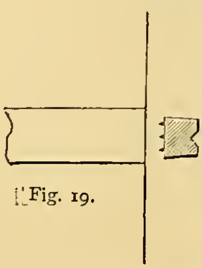


Fig. 19.

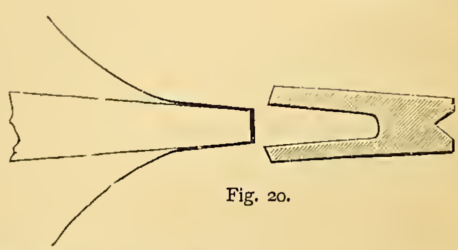


Fig. 20.

FIGS. 18, 19, 20.—DIFFERENT MODES OF HOLDING WORK TO PATTERN.

be lubricated whilst being spun ; tallow, oil, or soap being most often used for this purpose.

After having succeeded in shaping such simple articles as boxes, plates, bowls, cups, etc., in these harder metals, we will turn our hands to more fancy work. I daresay most of you have seen pretty services of polished oak with the edges bound with silver ; well, we will now try our hands at edging one of these articles. Let us take, for instance, a salad bowl, such as shown in section Fig. 14, the top and bottom edges to be bound with copper, this binding, when finished, to be electro plated. The thickness of the top edge of bowl is ½ in., and the copper rim is to be ½ in. deep outside, and ¼ in. inside. Let us then take a strip of copper of the requisite thickness, 1¼ in. wide, and cut it about ¼ in. longer than the outside diameter of bowl. Now scarf the ends neatly, and braze with silver solder. This can be done in a few minutes with one of Fletcher's blow-pipes, resting the copper ring on a piece of charcoal. The next thing to do is to put the copper ring on the bowl ; it should be a tight fit, and should be further secured with a little cement, the edge overlapping the top by ¾ in. The bowl is placed true in the lathe and firmly chucked.

Now that the work is ready, a very few strokes will finish it. The copper is worked across the top edge and down the inside, the rough edges are turned off, and a final polish given with a little rouge. The rim is now taken off, and the bottom edge done in the same way. When both are done they are plated, and finally fixed on with small, round-headed screws.

Let us now take another example. Suppose we want to put a silver head to a favourite walking-stick, this is the way to do it: Place the stick in the lathe, the head towards the back centre. Turn it to the proper shape if the stick is thick enough for this ; but if the knob is wanted bigger than the stick itself, a quantity of elastic glue can be stuck on the end, and this when hard turned to shape. The disc of thin sheet silver, which can be obtained from any working jeweller, is now placed at the end, and worked to shape ; the rough edge is turned off, and it is finally polished.

What we have already done has been very plain and straight-forward, where the work is finished in a few strokes, and the pattern is easily followed.

Fig. 15 represents the next piece of work we shall attempt, this being a subject totally unlike the previous ones. For facilitating the work, we will divide it into three parts—the foot, A to B ; the stick, B to C ; and the top or holder, C to D. From the instructions already given the learner should have no difficulty in making either the foot or the top. The most difficult part is the stick, from B to C. The first thing to do is, of course, to make the pattern ; this done, measure the largest diameter. This will be found to be at E. Now make a copper tube of this diameter, and of the proper length, the joint to be neatly brazed with silver solder. Before going any further, a template of card-board or thin tin should be made ; A, Fig. 16, represents this template. The copper tube is now slipped on the pattern, and the template being placed close to it, apply with considerable pressure a round-nose burnisher at the places where the template indicates the smallest diameter in the enclosed pattern.

When the copper tube is roughly shaped, it should be examined as to truth by approaching the template to the work. When found to be pretty true, it should be very carefully finished off, so as to avoid leaving any unsightly marks. It is now finished, and should be taken out of the lathe, and put in a clear fire ; the pattern is thus carbonized, and can be easily scraped out. The three parts being finished, they should be neatly soldered together, replaced in the lathe, and polished.

I will now suppose the learner to have profited by my instructions, so that he can spin any simple article of lead, Britannia metal, brass, copper, or silver ; so I will finish by giving an example of a difficulty that often occurs.

Fig. 17 represents a copper plate being spun into a concave mirror, and the edge is frilled or buckled. A block of wood, A, behind the tool, B, will soon cure this. This buckling will often happen when the work is of large diameter, or badly supported by the pattern. Figs. 18, 19, and 20 show different ways of holding the work to the pattern when their bearing surfaces are not sufficient to hold them.

THE VIOLIN: HOW TO MAKE IT.

By EDWARD HERON-ALLEN.

III.—THE SIDES (OR RIBS), SIDE-LININGS, AND BLOCKS.

THE first step to be taken towards the making of a fiddle is the selection of the wood. I have already pointed out the advisability of keeping woods stored in certain dimensions, it will therefore be simply a matter of search and taste to select a "set" of wood (*i.e.*, a wedge for the back, a block for the neck, six strips for the sides, and a wedge for the belly), handsomely figured and acoustically good.* Having decided this, we proceed to "prepare" the wood for the various operations to which it is to be submitted, beginning with the sides. If the wood has been

* *Vide* list of woods and tools, page 232, 233.

stored in strips $15\frac{1}{2}$ inches long, by $1\frac{5}{8}$, three such strips will be required; but I have recommended the selection of six, to provide for accidents of all sorts, which *will* come about when an amateur is working with a brittle strip of wood $\frac{1}{16}$th of an inch thick. Before proceeding further, let me give a word of warning about the selection of these strips. It is this: beware of extra-handsome wood; that with the finest and boldest curls is excessively difficult to work with, chipping away under the knife, plane, and scraper to an alarming degree; and, worse than all this, when the work is finished, and your sides are set, and your fiddle varnished, handsome wood will often take the wavy surface shown in the section, Fig. 23, a phenomenon often observable on fiddles with extra-handsome sides. The best slips are those with a fairly close curl, not too strongly marked. All things being thus considered, you may now set to work.

Take an ordinary clamp, as at Fig. 1 (p. 231), and by means of it, and a small piece of protecting wood, fasten the strip to the bench at right angles to the edge of the bench; then take the small plane, whose cutting edge, instead of being plain, is very finely toothed, and with a few sweeps just remove the excessive roughness of the strip, then firmly smooth it throughout its entire length with a scraper, and the first operation is finished. Above all things, be most careful that the edge of the plane project only the very smallest possible, for, in addition to the thinness of the wood you are working with, the wood is in itself perhaps the most brittle of all to work with, and the handsomer the curls in the wood, the more brittle it is. The scraper should be used *against* the direction of the curls; that is, if the curls (or figure of the wood) incline towards the right, the cutting edge of the scraper should be slanted towards the left. After each sweep of the scraper, raise it well to bring it back for the next sweep, or, catching the edge, it will snap the wood. Mind and let neither of these processes go too far; mind and not thin your strip too much, for remember that this is by no means the final smoothing, and if worked too thin at the commencement of the work, the after results will be disastrous; therefore leave the strip rather rough than otherwise. Then take three of the strips thus prepared, and with a pencil draw lines across them, as follows: Across two of them, at a distance of $5\frac{1}{2}$ inches from one end, and across the third, at a distance of $7\frac{1}{2}$ inches from one end. Then, with a firm stroke of a small fine knife, cut the strips across at those lines, and it will be found that you have two pieces $7\frac{1}{2}$ long for the upper bouts, two pieces $5\frac{1}{2}$ long for the centre bouts, and two pieces $9\frac{1}{2}$ long for the lower bouts. These lengths are in excess of what is absolutely necessary; but it is better to allow for accident than to start with your wood too small. Now cut eight strips of linen (*not* calico) $3\frac{1}{4}$ inches long by $1\frac{1}{2}$ broad, spread glue on both sides of one end of each piece thus cut, about $1\frac{1}{2}$ inches down, and folding the strips of linen in the middle, cover one end of each strip with linen, so as to protect the edge; the shortest (or $5\frac{1}{2}$ inch) strips must thus be covered at both ends; for the others, one end will be sufficient. The reason of this operation will be demonstrated further on.

The next operation which must occupy us will be the bending of the sides; that is to say, to bend them so far like the part of the mould on which they are to be fixed, that they will not split when finally cramped into it. First thoroughly heat your bending-iron (Fig. 4); when heated, cramp it on to the bench horizontally, so that the hot broad part and end, A, B, lies over the edge; sit down opposite to it, and proceed to this most ticklish part of your work with a cool head. The iron, when you commence to bend, must only be just hot enough very slightly to singe a slip of wood when pressed against it; the time of this condition must be tested by periodically trying to bend over it a thin slip of wood, kept for the purpose. First, bend the C's, or inner bouts, beginning at the two ends covered with linen, set the end on the part B of the iron, holding it there firmly with a block of wood, at the same time applying very gentle pressure to the other end. It will not begin to bend till it is thoroughly hot through, so do not hurry it by heavy pressure, or it will split (the tyro generally splits several to begin with). Bend it thus very carefully round B, and then bend the other end similarly, then give it the final shape on the broad part, A. Fig. 24 shows the various stages of the bending of the centre bouts. The linen is, of course, understood to be there, though it does not appear in the figure.

The upper and lower bouts must now be similarly bent, though, of course, it will be appreciated that only the linen-covered ends (which join the corner-blocks) will require the decided bend given by the part B of the iron. Fig. 25 shows the successive stages of the bending of the upper and lower bouts, which are, of course similar, except in point of actual size. This done, you must carefully remove with a sharp knife, all the projecting linen from the ends. The heat of the iron having scorched the glue, this will be a comparatively easy operation, but in places the linen will still adhere closely, and here you must be most careful not to bring away little pieces of the curls of the wood, which would irretrievably damage the beauty of your sides. The least vestiges of glue and linen must be finally scraped away with a file, which should be flat on one side and round on the other (Fig. 5), after which you may proceed finally to fit and fix your sides into the mould. This is done as

follows: Begin with the lower bouts, taking your leaf of maple, bent as at D, Fig. 8, and fit the top end as nearly as possible to the bend of the corner O, marking it off absolutely square with the T-square, and cutting off the superfluous end with a knife, then proceed to bend it as nearly as possible to exactly the shape of the lower bout (H, *Sup.*, Part 17), by means of the hot iron; when this is done, take the cramping block (H, *Sup.*, Part 17), and setting it against the inside of the lower bout, so that the cork side exactly presses it as far as it extends, cramps it firmly to the outside of the mould, by a cramp, Fig. 1, being most careful that the top bend fits exactly, and extends to the end of the corner O. Then at the point where the line A (part of the line A B) exactly bisects the bottom curve of the mould, mark the rib in pencil with a T-square, and cut it off exactly square with a sharp knife; then proceed exactly in the same manner with the left hand lower bout I, fitting it to the corner P, and cramping it at the curve with the cramping-block (I, *Sup.*, Part 17). Cut it off at the point A, the same as the other, perfectly square, so that a complete and perfect joint is formed, as close as that of the back and belly. This must most particularly be aimed at, as a perfect joint at the bottom is a sign of good workmanship; but if by some mishap you do not get a good join, do not start fresh with another strip for a new lower bout, unless your material, time, and temper are inexhaustible, for a bad join can be disguised as will hereafter be shown, with a strip of purfling; thus adding an ornamentation *ex necessitate rei*. Guarnerius constantly did this, and even the great Stradivari did not disdain to make use of this happy expedient when his masterhand failed him at this most critical point. Next proceed with the upper bouts, working in exactly the same way from the corners, Q and R, clamping with the blocks L and M (*Sup.*, Part 17) respectively, you need not be particular to a quarter of an inch for the joint of these upper bouts (on the line B) for the neck will hide the join, be it good, bad, or indifferent. You will have to place cramps at the points O, P, Q, and R, to keep the ends of the sides into the corners O, P, Q, R, placing little slips of wood between the iron arm of the cramp and the wood of the bouts, to protect the latter from being bruised or dented by the pressure, unless of course you mean to proceed at once with the work, in which case these last cramps will not be required. Now finally set the lower bouts to shape and cramp them into the mould, seeing that they are thoroughly freed from all vestige of glue or other mess. When fixed, there must be a slight rim above and below the mould, caused by the superfluous breadth of the slips from which you have made your sides. Now take some slips of paper, about 1½ inches broad, and slip one through at the bottom join of the sides, between the springy lower ends of the bouts and the base of the mould; glue lightly both sides of the slip, *above* the place where it is held between the sides and the mould, and pull it through from the other side, so that in fact the lower ends of the lower bouts are glued to the paper, and the paper to the side of the mould, so that the sides are fast in the mould; put similarly glued slips of paper between the sides and the mould, at the points, S and T (*Sup.*, Part 17) in a similar manner, and proceed as before to shape, set, and cramp the upper bouts, setting the papers at the top joint U and V (*Sup.*, Part 17). Now proceed to the fixing in the rough of the top and bottom blocks. Take two pieces of fine, even-grained pine*, planed round the sides and edges till they are both about 2 in. long by ⅝ broad, 1⅜ deep, the grain setting as in Fig. 26. Now, with a sharp knife and file, shape the side B of the block (Fig. 26), to the very slight curve of the bottom of the sides, mark across the top, by means of the line A, the exact centre of the block; now glue this on to the sides, exactly in the centre of the base of the mould (*i.e.*, so that the line A on the block exactly coincides with the line A —part of the line A B), in the centre of the base of the mould (*Sup.*, Part 17), and fix it securely with a clamp. Cut, shape, and fix an exactly similar block at the top of the fiddle in the same way. After each of these operations, take a fine brush, and with a little hot water out of the glue-pot, wash away from your work all traces of superfluous glue. Now proceed to fix the inner bouts, or, as they are technically termed, C's; these must be most carefully bent to the exact shape of the mould, cutting the ends square, and to exactly the right length. The ends must also be cut to a bevel, so as to fit into the corners, against the upper ends of the lower bouts, in the manner shown in Fig. 27, which is drawn the actual size of the mould (*Sup.*, Part 17). When you have got them thus to fit, and cleaned and scraped them thoroughly inside and out, cover the bevel of the ends of the C's with glue, slip them in so that the glued ends fit against the lower bouts in the corners, as in Fig. 27, and cramp them in with the cramping-blocks, J and K (*Sup.*, Part 17). Now take a fine slip of wood, and dipping it into the glue, just run it into the corners so as to complete the join, remove the superfluous glue, and set the mould to dry. Bear in mind throughout the operations of setting the sides and blocks, to leave a little rim of wood above and below the edge of the mould, to be shaved away when bevelling the sides to the diameter of the

* Some makers (Stradivari amongst them) frequently used sallow wood for the blocks and linings, as being lighter than deal. There is hardly, if any, difference between them, and the mode of working is the same. Vide on this subject, p. 210, Vol. I.

mould, otherwise, if the sides do not reach the surfaces of the mould they will be found to be too shallow when you come to fix on the back and belly. The next operation is the cutting and fixing of the corner blocks. Take two square-sided pillars of wood $2\frac{6}{8}$ in. long, the one for the lower corners having the ends 1 in. by $\frac{5}{8}$, the other for the upper corners having the ends $\frac{6}{8}$ by $\frac{5}{8}$. This length is just double what is required, and for this reason, that the corners being almost always in contra-facsimile, they may be cut to the right shape throughout their length, and sawn in half, which will be a great saving in point of time and work.

The blocks must be shaped from the square in

FIG. 23.—WAVY FORM SOMETIMES ASSUMED BY WOOD.

FIG. 24.—STAGES OF BENDING CENTRE BOUTS.

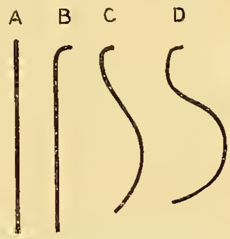


FIG. 25.—STAGES OF BENDING UPPER AND LOWER BOUTS.

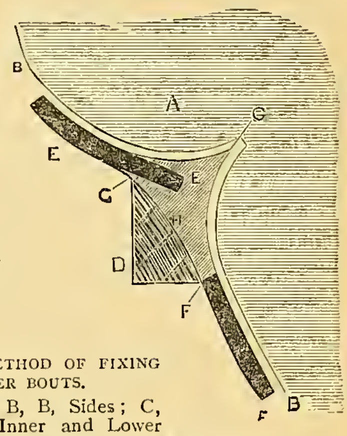


FIG. 28.—METHOD OF FIXING INNER BOUTS.
A, Mould; B, B, Sides; C, Joining of Inner and Lower Bouts; D, Corner Block; E, E, Linings; F, G, Joining of Side Linings.

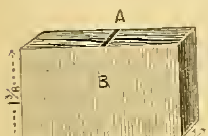


FIG. 25.—TOP AND BOTTOM BLOCKS.

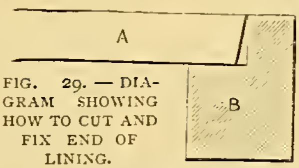


FIG. 29. — DIAGRAM SHOWING HOW TO CUT AND FIX END OF LINING.

FIG. 31.—MODE OF BEVELLING INNER EDGE OF LINING.
A, Sides; B, Lining.

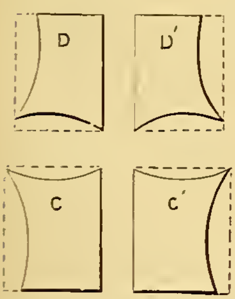


FIG. 27.—CORNER BLOCKS.
C, C′, Plan of Lower Corner Blocks. D, D′, Plan of Upper Corner Blocks.

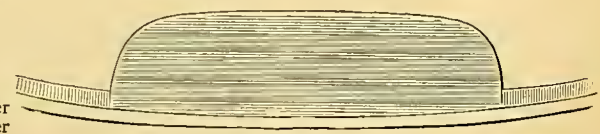


FIG. 30.—TOP AND BOTTOM BLOCKS FOR MOULD. Full size.

the manner shown in Fig. 27, the dotted lines showing the two sides before they are cut away with the gouge. The greatest care must be taken to make them fit perfectly throughout their length to the sides, as in Fig. 27, before they are cut in half, and fitted into their respective corners. The lower corner blocks (C, C′, Fig. 27) will be cut from the first pillar, and the upper ones (D, D′, Fig. 27) from the second. When glued, they must be strongly pressed into the corners, both outwards and upwards, so as to fix them closely to both the upper (or lower) and centre bout (or C). When this is done, and the blocks are firmly cramped into their places, the superfluous glue must be washed off with a brush and hot water, and the whole mould put away to dry thoroughly. Whilst it is drying, you may proceed to prepare your side-linings; the wood for these should be cut into long slips, $\frac{5}{16}$ inch broad and $\frac{3}{32}$ thick; and of these slips you will require for one fiddle four $9\frac{1}{2}$ inches long (for the lower bouts), four $5\frac{1}{2}$ inches long (for the inner bouts), and four $7\frac{1}{2}$ inches long (for the upper bouts). To guard against accidents, it is well to have three or four extra slips, to take the place of any that may snap in the bending. Before commencing to bend them, having cut them roughly to these lengths (which are all in excess of what is required), let them soak for at least an hour in cold water. Now, having heated your iron to a fierce heat, bend them to the shapes they are required to take, not hurriedly, but quickly, and with decision, having previously well fixed in your mind the exact bend which is necessary. The wet wood must rest against the flat side of the thick part of the iron (A, Fig. 4) long enough to be well heated through before commencing to bend, but not so as to scorch it too much (a little scorching will not matter to the linings).

By this time the corner blocks being thoroughly firm, you can proceed to render the sides and blocks exactly level with the surfaces of the mould. Where there is but little of the sides above the surface, it may be filed away with the flat side of a file; but for the blocks, and when there is a good deal of the sides to file away, you must use the toothed plane. Before commencing to plane the blocks, the tops and bottoms must be well wetted with warm water, which will prevent their splitting away, to further guard against

which the iron teeth of the plane must only project to an infinitesimal degree. If there is much of the block to be cut away, you may begin to remove it with a knife, finishing up with the plane. If the operation of wetting the tops of the blocks has loosened the glue by which the sides are fixed (with papers) to the mould, you must secure the block with a cramp before reducing it. Throughout this operation you must not reduce either the sides or the blocks *quite* to the level of the surface of the mould. This finishing touch will not be put until the side-linings are fixed, which you may now proceed to do, beginning with the inner bouts in the following manner :—First cut out the little slit as at G, Fig. 28, by making two deep cuts with the knife, and removing the wood between them with the "lining" chisel (Fig. 7). Take great care not to make this cutting too deep or too wide, testing it in these respects as you cut it by means of a waste slip of lining. When this is achieved, cut off the end of the lining with a cut slanting from the top, as in Fig. 29, which shows the section of the lining A fitted into the block B. Now in the same way cut off the other end of the lining, and set it in a similar cutting made in the upper corner block, and leave it thus till the other linings are fitted. Cut and fit the linings of the upper and lower bouts in a similar manner *against* the corner and top and bottom blocks, as at F, Fig. 28. They are not *let into* the blocks, like the inner bouts, but the lower ends of the corner blocks are just shaved square with the sides, as at F, Fig. 27, so as to fit the ends of the linings. The ends of the linings are cut with a slight slant, as in Fig. 29, to make them fit well and tight against the blocks. If by any accident the linings become a shade too short, this fault may be rectified by inserting between them and the block a little splinter wedge of pine to supply the deficiency.

Having fitted both the upper and lower linings all round, the next operation is the gluing and fixing. This must be done very quickly, *especially* if the weather is at all cold, or the glue will worry you by cooling as you work. Begin as before with the C's, or inner bouts, and be careful before beginning that all embracing surfaces (*i.e.*, the surfaces of the sides and of the linings which are to be glued against them) are perfectly cleaned with a file and scraper. Take a waste slip of lining and thin the sides at one end to a wedge ; dip this in the glue, and with it thoroughly glue the inside of the little slits in both corner blocks, quickly coat the inside of the upper lining of the C with glue and set it in its place, pressing it firmly into the slits and against the sides ; glue and set the lower lining in the same way, and before the glue has time to set, wash away the superfluous glue and cramp the linings to the sides by means of the cramping blocks, J and K (*Sup.*, Part 17), placing a slip of paper between the linings and the cramping blocks. Fix the other C linings in the same manner, and next glue and fix the linings of the upper and lower bouts, which are done in the same way, excepting that if the lengths have been properly proportioned so as to fit tightly no cramping blocks will be necessary, the superfluous glue being washed away at once and the mould set to dry. If, however, you distrust your cutting, you may cramp your linings to the sides in the same way as you cramped the sides to the mould, interposing, as with the inner bouts, slips of paper between the linings and the cramping blocks. When these are quite dry, proceed to render the edges of the side blocks and linings exactly level with the surfaces of the mould by means of the toothed plane. When this is done, take a sharp knife and cut the inner edges of the linings to a bevel, bevelling off a little more than half the depth of the linings, as at B, Fig. 31 ; when this is done, finish them with a file, removing any paper, etc., which may be sticking to the linings and not removed by the knife. Next shape the blocks to bring them as at F, Fig. 28. The corner blocks will be cut with the gouge till they take the shape in the figure (Fig. 27, Vol. I.), cutting away all outside the line H, Fig. 27). The top and bottom blocks must next be cut to the size set down in page 210. Fig. 30 represents the actual size and shape of the blocks for the mould (*Sup.*, Part 17). If there is any difference between the top and bottom blocks, the top one will be just a shade smaller than the other. The Guarnerius block is more a segment of a circle, but as the mould (*Sup.*, Part 17) is Stradivarius, I give a Stradivarian block (Fig. 29). The greatest care must be taken in cutting both the corner and end blocks quite parallel with the sides, *i.e.*, that the outline of the block may be identical at both top and bottom. They must be finished off with the file, after which the whole of the inside, *i.e.*, the sides, the linings, and the blocks must be thoroughly sand-papered and cleaned, after which the inside of the mould will present the appearance of Fig. 27, Vol. I.

The next operation is that of taking the now completed sides (or ribs) of the fiddle out of the mould to clean and finish the outer surfaces. You will remember that the ribs are fixed into the mould with slips of glued paper, these must now be loosened in the following manner. Take an ordinary small table-knife with a fairly narrow blade, and thrust it carefully through between the sides and the mould at the points where the paper is fixed, passing it along wherever the paper extends. This operation will be accompanied by a series of the most ominous cracking sounds, which are, however, merely false alarms, though you must carefully guard against shaving or splitting off little

snips of the sides as you pass the knife along. Having thus cut the fixings at all these points, proceed *very* carefully and gradually to poke the ribs through and out of the mould, pressing on all the blocks and bouts carefully in succession, having first marked which is the top of the blocks, to serve as a guide. Now proceed to cleaning the outsides and generally finishing up. Begin by removing by means of hot water and a brush any vestiges of the papers which remain glued at the points where the ribs have been fixed in the mould. Do not be too liberal with the water, and dry the ribs immediately, or they will ward horribly. If any little snips of the curl have been cut out in taking the ribs out of the mould, if possible these very snips, and if not, similar chips must be glued on again. If the joint of the corners (at C, Fig. 28) is not close and tight, the interstice must be filled with glue mixed with chalk, but it is to be hoped that this will not be required. The ends of the corners must now be cut flat and square to the sides (as at C, Fig. 28) by means of a knife and flat file, testing the work with the small square, and being very careful not to chip off the edges in cutting away the parts that are immediately adjacent to the corners, and the corresponding parts inside the C's must now be cleared of all traces of burning or glue with a small chisel and round file, and any vestiges of glue all round the outside of the ribs must be removed with a flat chisel, after which go carefully and completely round the entire outsides with a sharp scraper, and fine glass paper, till they are perfectly clean and smooth as satin. The sides or ribs of your fiddle are now finished, and you must put them away into the mould (into which they will now slip quite easily), out of harm's way, till you are ready for them. For future purposes you must mark which is the top (or belly side) of the ribs, and which is the bottom ; write, therefore, "top" on the top of the blocks, so that when you take them out of the mould there may be no confusion on this point.

(*To be continued.*)

BOOKBINDING FOR AMATEURS.

By the Author of "The Art of Bookbinding"

V.—COLOURING THE EDGES.

THE next thing to be done after cutting the edges is to decorate them, except, indeed if it is wished to leave them white ; white edges have, however, the disadvantage of becoming very dirty, so that it is advisable to have a colouring or preservative of some sort. The most common and quickest method is to sprinkle, and the best colours for the amateur to use are the aniline dyes ; "Judson's dyes" or "Hood's clyclods" give very good results, and can be bought at most oil and colour shops for a few pence, and, as they last a very long time if kept in a bottle, the expense per edge or book may be said to be the fraction of a farthing.

To sprinkle, take any of the dyes, mix with water to the shade required, place the book in the press to hold it, take a common nail brush, dip it in the colour (but do not take up too much colour, or it will fall in thick blotches), rub the brush lightly over a common cinder sifter, holding the sifter high over the book, the colour will fall in a very fine spray on the edge. Several colours may be used with very pleasing effects, but each colour must have a brush, and each colour should dry on the edge before another is sprinkled, or they will run one into the other. If a further or more fanciful decoration is wished, place the book in the press, pinch it up rather tightly, place some rice, or seed of any kind, or breadcrumbs, on the edge ; now sprinkle rather darkly, say with green ; when dry, place some more seed, or whatever has been used, on the edge, and sprinkle very dark with brown ; when dry, take the book out of the press, knock off the seed or rice, and the result will be an edge very much like marble—in fact, better than a good many marbles seen on books now-a-days.

To colour the edge with a uniform tint, place the book in the press between cutting-boards, screw up tightly, with a sponge dipped in any of the above-mentioned colours go over the edge carefully. It will, perhaps, be better if the edges are scraped before the colour is put on. To do this, take a piece of steel, grind it on its edge, and rub it well on an oil-stone. Holding the scraper between the two first fingers and thumbs, the edges are scraped ; when done properly the edge should feel as smooth as a piece of glass. By scraping the edges, the colour put on the edge is more even. When dry, burnish.

Marble Edges.—I had written the process out, but have come to the conclusion that it is too much for the amateur to attempt with good results. There are a number of book-edge marblers in the trade, and the amateur binder had better let them marble his books ; it is done for such a small sum that it is worth paying, if only to get rid of the mess marbling occasions. Messrs. Corfield, of *St. Bride Street*, *E.C.*, Messrs. Eadie, *Queen Street*, *W.C.*, or Gwynn, of *West Street*, *St. Martin's Lane*, are three amongst many that may be mentioned. The price is from twopence per book according to size. When dry, they should be burnished.

Gilding.—The next process to be mentioned is that of gilding. Gilt edges are the best preservative against external injury and damp. The necessary materials are :—

1st. A gold cushion, as in Fig. 30, to cut the gold

on. This may be purchased ready for use at the material dealers, or may be made by covering a piece of wood, say 12 inches by 6 inches, with a piece of white calf, the rough side outwards, and padded with blotting-paper or cloth, cut so that it will form a bevel at the edge, but quite flat on the top, the calf to be neatly nailed all round the edge.

If a small box be covered, with a drawer or two in

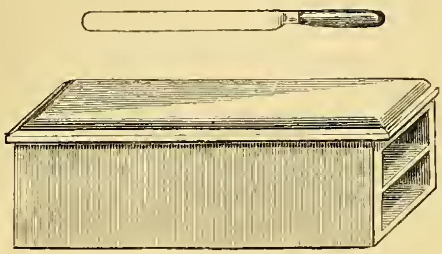


FIG. 30.—GOLD CUSHION AND KNIFE.

it to put the necessary gilding tools in, so much the better.

2. A gold knife, price from one shilling. Also shown in Fig. 30, with the gold cushion.

3. Burnishers. Are made of agate stone, can be purchased any size. A flat and a round one will be sufficient.

4. Glaire water. This is made from albumen. Take the white of an egg, put it into a jug with three times the quantity of water, beat it well together, allow it to stand some hours to settle, then pour the clear off for use.

5. Scrapers. As above mentioned. The beauty of edge-gilding depends greatly on proper and even scraping.

6. Gold leaf. Bought in books. Do not use the common rubbish because it is cheap; pay a proper price, and get gold leaf; if not gold, it will soon turn black, you will then have all your work for nothing.

To gild the edge, the book should be put into the press straight, and on a level with the cheeks of the press, between cutting-boards, the boards of the book being thrown back. The book should be screwed up very tightly, and the edge scraped quite flat, and perfectly even. A mixture of black-lead and thin glaire water is painted over the edge with a soft brush, and with a hard brush it is well brushed until dry. Lift a leaf of gold out of the book with the gold knife, lay it on the gold cushion, breathe gently on the centre of the leaf to lay it flat; it can then be cut with perfect ease to any size. The edge is now to be glaired evenly by means of a soft brush. Take a piece of writing-paper, grease it by drawing it over the head, lay it gently on the gold—the gold will adhere to it; now lay it gently on the glaired edge; it will at once come away from the paper. Allow the edge to get perfectly dry, which will take some two or three hours; when dry, burnish it. To burnish an edge, rub a piece of beeswax on the palm of the hand, now rub the hand over the edge, hold the burnisher firmly in the right hand, resting the end of the handle on the shoulder to get better leverage. Work the burnisher backwards and forwards with a perfectly even pressure on every part. To gild the fore-edge, make it perfectly flat in the same manner as in cutting (it will return to its proper shape again when released from the press), and proceed as above. Edges can be gilt at a very low cost by giving them out to be done; the material-dealers will always tell you the nearest book-edge gilders.

Head-banding.—Head-banding is not a necessity; it only gives the book-edge a better finish. It can be bought at any bookbinders' material-dealers by the piece of twelve yards, from 1s. 6d. upwards, according to quality. The different sizes are numbered; the most useful are Nos. 2 and 3. Should the amateur wish to make his own, he can do so by using striped calico. The material must be cut into lengths of about one and a half inches wide, with the stripes across. Cords of different thickness are cut somewhat longer than the calico. Fasten one of the pieces of cord at one end by a nail on a board of sufficient length. Paste the calico, and lay it down on the board under the cord; now turn the calico round or over the cord, and with a folder rub into a groove. To stick the

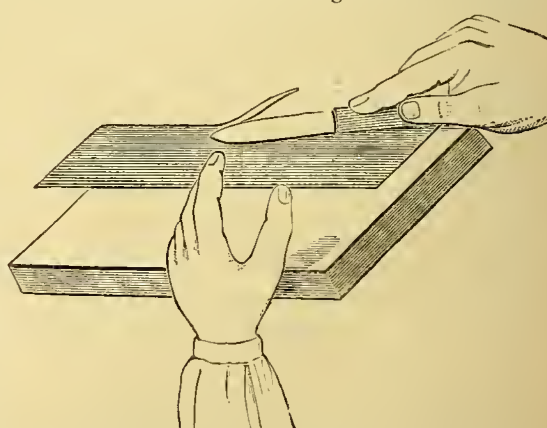


FIG. 31.—MODE OF PARING EDGE OF LEATHER.

head-band on, glue the head and tail of the book, place the head-band on the back, the thick part (where the cord is) flush with the edge, cut it off with the scissors close to the side, then press down gently but firmly, so that it sticks properly.

Our next process is to prepare the book for covering. The amateur had better make his book with a tight back, because I think he will be able to make a better and stronger job of it than if he were to attempt

hollow backs. The difference between the two is, in the tight back the leather is fastened on the back; in the bollow, paper is fastened on tbe back, the leatber being on a second paper, thus making the leather independent of the back. Place the book in the press, exposing tbe back, glue the whole of the back with good bot glue ; now take a piece of strong paper, sucb as writing-paper (any paper tbat will not split will do), place it on tbe back, and rub down well with a strong folding-stick, allow it to get perfectly dry ; when dry, peal or tear away the overplus from the sides, bead and tail. If a very thick or large book, a second paper may be added, treating tbe second paper in the same manner.

The bands or ribs may now be fastened on the back if it is desired to have any. Mark the back into six equal divisions, allowing the bottom space to be larger than the rest ; if tbe same size, the book is apt to look top beavy, especially if it has a broad back. Glue some thick string, place it across the back on tbe marks made, allowing it to project a little over the sides ; if the book is now laid down on its sides on tbe ends of the strings, and a board or something heavy is placed on the top, the bands or cords will stick to the back better tban if left to dry with notbing to hold the ends down. Too much glue must not be put on tbe cords, or if calf is used for covering, tbe glue may possibly go through and stain it, but this need only be feared with calf ; for otber leathers, it is best to glue the back, and then stick the cord on, as it will belp the paste used in covering to stick better. When quite dry, the ends must be cut off, and any glue on the boards cleared away.

Covering.—Tbe best of all material used for covering books is morocco, it is certainly dearer than anything else, but it is stronger and looks better. The skins can be bought from 7s. upwards, according to size and quality ; but as a good many dealers sell pieces, a piece can always be bought for a small sum. It will be advisable if I enumerate the various kinds sold. First, we have morocco of all kinds from 7s., up to 18s. and £1 per skin ; russia, on an average 40s. per hide ; calf from 5s. 6d. per skin ; roans used for imitation morocco, from 4s. per skin ; cloth from 6½d. per yard ; buckram from 1s. 4d. per yard ; vellum, parchment, velvet, silk, satin, and others, may be mentioned. To cut a cover out, if for whole binding, the cover should be about half-inch (or more according to the size of the book) larger than the book itself, the extra being for the turning in ; if for half-binding, cut half-inch longer than the book itself, and allow for the sides as much as is wished, bearing in mind that a narrow side always looks niggardly ; the corners should be in proportion to the leather on the sides.

All leather covers must be pared round the edges with a knife, as shown in Fig. 31. Place the cover, grain side down, on a piece of marble or thick glass, and with the knife, which must be made very sharp, move the knife forward diagonally, cutting the fleshy side away about half an inch from the edge, the object being that the leather loses itself, and that the edge is not seen when covered. Care must be taken that the knife does not go through the leather, as it will do if held at too great an angle. When pared, the cover is pasted all over, allowed to soak a bit and repasted. The boards must be looked to to see that they are even all round, and the book laid on the cover carefully, which must be drawn over evenly but tightly. The edges must be turned in all round, using a folding-stick to lay it down evenly round the edge of the boards. If the book has had bands put on the back, they should in some way be pinched up to make the leather adhere properly. In binding establishments, special-made pincers are used, but if the amateur takes a piece of hard wood with a groove in it the same size as the bands, by pressing the band into the groove and working the wood to and fro, the result will be the same as with the pincers, the only drawback being that the bands should fit the grooves, so that two or three pieces of different sized grooves are necessary. These are called "band-sticks;" they must be perfectly smooth, or will rough the leather ; wood of close grain is the best to make them from.

Bands are only used to russia, morocco, calf, and sometimes roan ; cloth, buckram, and other such-like material, are not suitable, as they do not stretch enough for bands.

When dry, the book should be opened, or eased, by throwing the boards back, wetting the leather turned in head and tail with a moist sponge or wet finger, and allowing it to dry with the boards opened. This will give the book much more freedom in the joints than is usually seen in amateur bindings.

Half-bindings should have the corners put on when the backs are dry ; and, let me say, never touch the book when covered until at least twelve hours have expired, that it may be thoroughly dried, or it will get out of shape. The corners should be cut out large, to allow for turning in ; they should be pared all round, carefully turned over, and laid down with the folding-stick ; when dry, the sides are put on, cloth or paper being used, if cloth, the same colour as the leather is generally chosen ; if paper, the same as the ends are made ; but this has to do with taste more than by rule. Glue should be used for siding, and the folding-stick used for turning the material sharply over the edge of the boards, rubbing the sides well down with the palm of the hands.

Pasting down the end-papers is the next operation.

With a sharp knife run round the inside boards, trimming off any unevenness that may be; tear the guard paper away, and clean away any glue or paper that is on or in the joint. With good paste, paste all over, and evenly the end-paper, taking great care that paste is in the joint; hold the paper up with the left hand, with the right press it gently into the groove, and rub lightly the paper down all over the board; with a very sharp knife trim the paper evenly all round, using a straight edge as a guide for the knife, but cutting only through the paper; take away the pieces or strips, and rub well down all over, especially in the joint or groove, using a piece of paper to protect the damp end-paper from tearing. Allow it to get thoroughly dry, leaving it standing up on end with the boards well thrown back the whole time. This is a much better way for the amateur than pasting the book down "shut," as the book opens with more freedom. When perfectly dry, the book should be pressed—with not too much pressure—for a few hours, using a tin inside the boards, and a millboard covered with flannel for the outside; when pressed, the book is ready for "finishing," that is the gilding, which will form the subject of my next paper.

(*To be continued.*)

RUSTIC CARPENTRY.

By ARTHUR YORKE.

I.—MATERIALS—CONSTRUCTION OF SMALL SUMMER-HOUSES.

PERHAPS among the many subjects treated in AMATEUR WORK none is calculated to appeal to a wider public than that with which I now propose to deal. All who have gardens and the most modest amount of taste for carpentry will, I trust, find something to their advantage in my remarks and sketches. For rustic work no nice skill and no elaborate kit of tools are required. In this department rough workmanship is no defect, and is, indeed, frequently an aid in producing the desired effect.

The causes which in rustic carpentry most often lead to the failure of the amateur will be found to lie in the want of sufficient strength of construction, in the employment of inappropriate designs, and in the non-observance of the rules of good taste in his work. On the first and last points I shall hope to give some useful hints; and as regards the second, to furnish a number of designs which may either be carried out as they stand, or which may be turned to account simply as furnishing suggestions.

Under the general heading of Rustic Carpentry I include all such outdoor woodwork, and architecture in wood, as is intended to be of a more or less decorative character, and in which the decorative effect depends on the use of material in a rough and natural state. This definition will embrace a wide range of objects, such as summer-houses, cottage porches, garden arches, fences, garden seats, and many similar matters. For so many of these as space will permit I propose to give designs, together with such diagrams of details as may be necessary to render them of practical value.

But before I proceed to do so, I shall have some remarks to make on the appropriateness and durability of the materials employed; and as I have had more than thirty years' experience in this kind of work, I can do so with some degree of confidence.

Materials.—It is to our more common woods of home growth, such as are cheap and abundant, that we shall have to look for materials. As a rule, wood for rustic work is most pleasing to the eye when covered with its bark, and is therefore generally used in that state. Yet it must be admitted that in exposed situations, the loose texture of bark causes it to retain moisture, and thus to hasten decay. In some woods the destructive action of the bark is very marked. Country carpenters aver that withy lasts twice as long when peeled.

Whenever it is intended to retain the bark, and to have it adhere closely, the wood should be cut down in winter, after the sap has fallen, and before it begins to rise again. But if peeling is intended, the wood should be cut when the sap is rising in full force—that is, just as the young leaves begin to appear.

Of all kinds of wood, none are of so much value in rustic work as larch-poles. Their straight and regular growth admirably fit them for constructive purposes, and cause them to be easy of adaptation to regular designs. For the heavier work in summer-houses, arches, fences, etc., they are unrivalled. Larch has also extraordinary powers of endurance. Among our common native woods it stands second only in this respect to heart of oak. Larch plantations now abound in most parts of the country, and when these receive their periodical thinnings the rustic carpenter can generally get a supply at a cheap rate.

Various other trees of the same family, such as the silver fir, common fir, and spruce, furnish poles equal for our purposes to the larch in all respects but one They have the same symmetrical growth, but they are considered far less lasting. Yet in this particular the common fir deserves a better character than is usually assigned to it. A summer-house is at present standing, built by me in 1851, in which all the heavier work is in this wood. The collar-posts do not rest on any foundation, but are simply planted in the earth. The soil is a wet clay. Thirty-two years in such exposure may be considered a tolerably severe test.

Those larch and other fir poles are bést which grow in thick plantations; but few lateral branches are then thrown out, and the trunk tapers almost imperceptibly. The branches of such poles are few and worthless, but where the trees grow in more open situations, the branches afford straight and valuable material for light work.

For that description of rustic work in which little or no regular design is attempted, the smaller branches of the oak—technically known as oak-bangles—have long been in favour. These are commonly found stripped of their bark, which has been removed for the purposes of the tanner. Contrary to the genera rule, these branches look best when peeled. To find a piece of oak-bangle in any way approaching to straightness is exceptional, and as a rule they are twisted, crooked, and contorted in all directions. They can, therefore, only be used in open-work where a space can be filled,—in very much at random. For effect they depend on their rough, grotesque, and picturesque appearance. In my own opinion, however, these qualities tell best when they can be brought into contrast with more formal lines, as in a panel of which the boundaries are straight pieces of fir. Being all or nearly all sap, oak-bangles quickly decay.

Elm branches may be used for the same purposes as oak, but, whilst less grotesque, they are still exceedingly irregular. In exposed situations—the vulgar belief to the contrary notwithstanding—they are much more enduring than oak.

Ash lasts reasonably well, but is decorative neither in colour nor form.

Withy is in many districts the most cheap and available of woods. Though far inferior in beauty and endurance to branches of the fir kinds, it is always to be found straight enough for geometrical work on a moderate scale. If peeled, its beautifully white colour will render it pleasing, by contrast, when used in combination with other woods wearing their dark barks. I have already noticed how much the above treatment tends to preserve it.

For employment in irregular grotesque work, in the same manner as oak-bangles, apple-tree wood forms a useful material; and special attention is directed to it, as it is one frequently to be had for nothing. In most gardens it is occasionally necessary to cut down an apple tree. The tree so removed is usually at once condemned to the fire. It would be well first to make sure that no part of it is proper for rustic work. Apple branches are far harder and more enduring than those of oak, and equally fantastic; particularly when, as is often the case, the surface rises into grotesque knots and excrescences.

For some minor purposes, especially when they can be used under cover, as in the interiors of summer-houses, hazel rods will be found useful. Their glossy and well-marked bark renders them highly decorative, and they are generally to be found sufficiently straight. They are to be obtained from the clearings of undergrowth in woods, and their market value is merely that of firewood.

Sticks also of maple and wych-elm, of the same size (one to two inches in diameter), are useful for somewhat similar purposes. Their curiously roughened bark—which on a small scale suggests that of the cork tree—renders them pretty. In many parts of the country they grow plentifully as "stools" in hedges, and are to be had at a firewood price when the latter are cut.

Indeed, most of the above-mentioned materials are, in the places where they grow, of very trifling value. The chief cost with all the smaller ones will be that of carriage; and some little trouble must be exercised in looking out for and securing them, as they are not always to be bought from dealers.

Construction of Summer-houses.—Since its employment in building and decorating summer-houses is one of the most important and interesting of the purposes to which rustic work can be devoted, it is with these structures that I shall begin.

In most instances the choice of a site for a summer-house must chiefly depend on the special circumstances of the case, and the individual taste of the builder. I may observe, however, that a dry situation is most important, and that to make such a retreat enjoyable as often as possible in our changeable climate, it should be screened from the colder winds. As an object of taste, a pretty summer-house, flanked by trees or evergreens, is pleasing to look at, and by a little judicious forethought may be made effective from the windows. Frequently, too, it may so be disposed as to hide what is ugly, such as back-offices, or an unsightly wall or building.

Figs. 1 and 2 show front and profile views of a summer-house intended for a garden of the most modest size, and Fig. 3 gives the ground plan of the same. The dimensions of this summer-house are—length, 8 feet; breadth, 4 feet; and height to eaves, 6 feet.

In regular wooden buildings it is usual first to construct a foundation of stone or brickwork. But this cannot well be done without calling in skilled labour, and for our purposes may be dispensed with. We must be contented with planting our main posts in the ground. Thus treated, they will undoubtedly be more exposed to decay; but, as I have shown above, they will, if of good material, endure as long as any reasonable person can desire.

And here I may as well explain that in the directions which I am about to give I shall advocate a

SMALL SUMMER-HOUSE
IN
RUSTIC CARPENTRY.

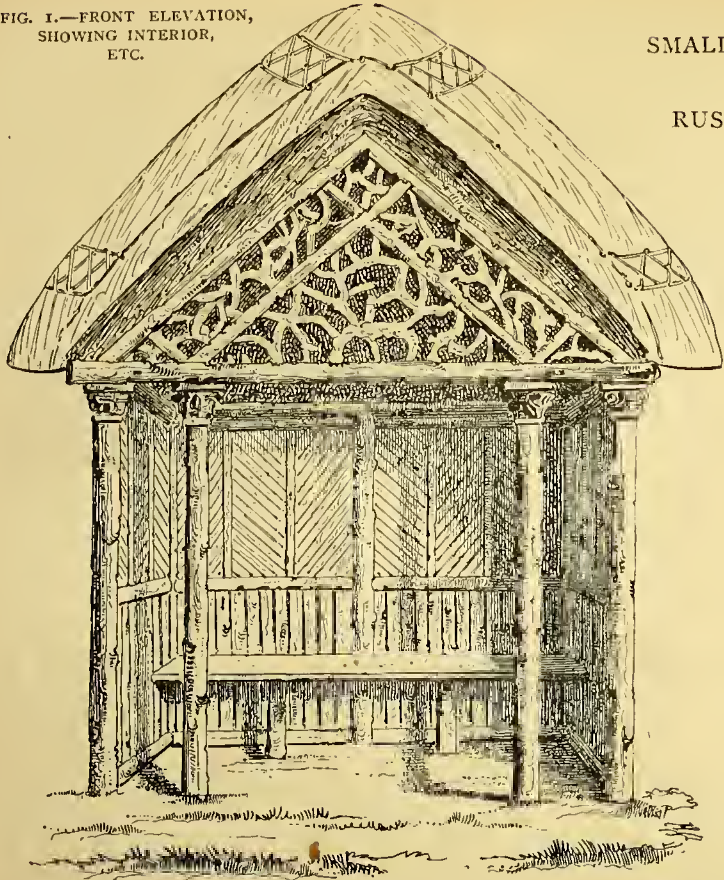


FIG. 1.—FRONT ELEVATION, SHOWING INTERIOR, ETC.

FIG. 2.—SIDE ELEVATION, SHOWING ARRANGEMENT OF THATCH.

rough-and-ready mode of construction at which skilled carpenters may be inclined to sneer. It is not, however, for them that I am specially writing. They are welcome to take my designs, and work them out in their own superior manner. Rustic work is pre-eminently an art for the little-skilled; and it is my object to point out such methods as may—so long as they are sufficient to give the required strength—be readily carried out by the roughest of workmen.

We will, therefore, plant our collar-posts (marked A, A, A, A in the ground-plan, Fig. 3) in the earth, like ordinary gate-posts. Not less than two feet should be allowed to go below the ground-line. They should be placed perfectly perpendicular by the plummet, and should be held in that position whilst they are tightly rammed in with stones and earth. If the bark is roughly shaved off from that part which is to go underground, and a coating of gas-tar is given, the wood will last longer.

The cross-pieces (B,B,B,B in Fig. 4) by which the tops of the posts are connected, will be found to bind the whole together with sufficient firmness, if joined at the corners as shown in Fig. 5. When the rafter is added, as there shown, a strong spike-nail passing through the three pieces and into the centre of the post will give solidity. A smaller nail or two, nearer the outside, may serve to hold the cross-pieces in place till the rafter is on. The top of the post is merely sawn flat to receive

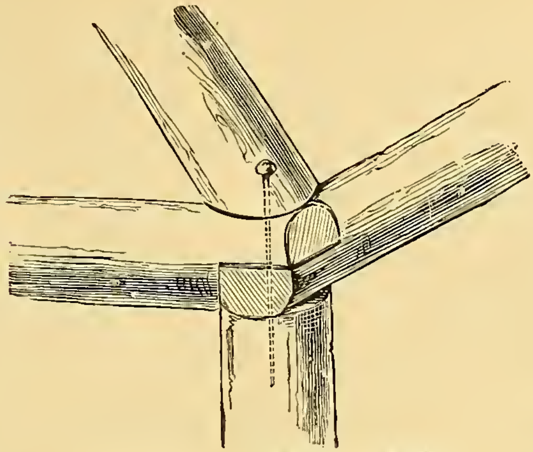


FIG. 5.—JOINING OF TIMBERS AT CORNERS.

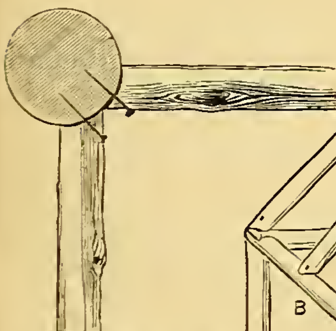


FIG. 6.—ENDS OF CROSS-PIECE OR LEDGERS.

these pieces. The posts, cross-pieces, and indeed all the large stuff used in this building, are supposed to be larch poles. As will be seen from the diagrams, a great proportion of this material, before being used, will have to be sawn in half. Sawing such pieces with a hand saw is slow work; and if a steam saw is within reach, the labour will be much lightened, and the expense not greatly increased, by having the re-

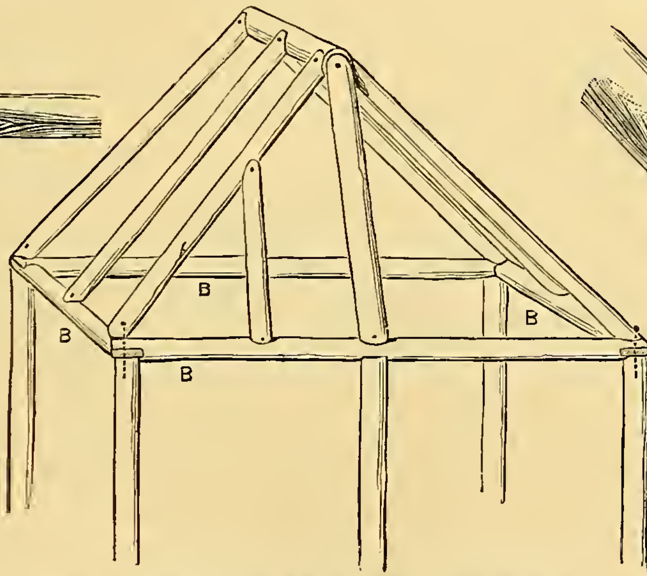


FIG. 4.—CONSTRUCTION OF ROOF OF SMALL SUMMER-HOUSE.

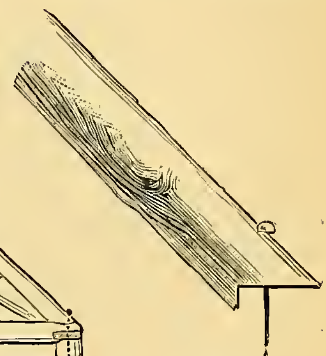


FIG. 7. END OF RAFTER.

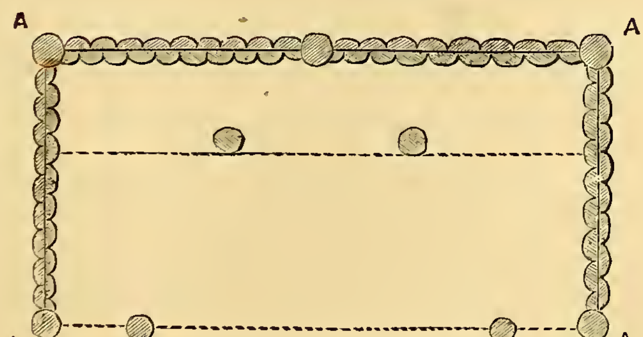


FIG. 3.—GROUND-PLAN OF SMALL SUMMER-HOUSE.

quisite quantity split by that machine.

It is of such half-stuff that the walls are to be formed. For the posts, poles of $4\frac{1}{2}$ inches or 5 inches in diameter are required, but those used in the walls need not be quite so large. Pieces have first to be nailed crosswise at top and bottom immediately below the wall-plates and above the ground-line. These must be on the inside, and so placed as that their flat, sawn surfaces may come opposite to the centres of the upright posts. A little attention to sawing the ends of these cross-pieces or ledgers, as shown in Fig. 6, will enable the builder to do this with exactness; and they must be secured with nails. Indeed, whilst working generally, as one has to do in rustic work, among round, or half-round stuff, it will be found that both strength and appearance will much depend upon the diagonal sawing of the ends of the different pieces, so as

best to make them fit against the rounded surfaces with which they will be brought in contact. This manner of sawing the ends will, as shown in the various diagrams, give great facilities for nailing, which is, in our rough art, almost the only method of forming joints. Against these two ledgers the uprights which form the walls are to be nailed, with their sawn surfaces inwards. Their upper ends are sloped off, so as to fit against the wall-plates, and their lower should be long enough to allow them to be let into the ground two or three inches.

The lining of the walls is, as shown in Fig. 1, in its lower part made of half-stuff, similar to that which composes the outer walls. The centre of each inner piece is, as may be seen from the ground-plan, brought opposite to the junction of two outer ones, so as best to exclude wind. The lining of the upper portions is of smaller half-stuff, arranged, as shown, diagonally for the purposes of ornamentation.

In Fig. 4, the construction of the roof is illustrated. From the top of the pediment a ridge-piece will be seen to extend backwards some 18 inches. The motive for introducing this feature, instead of allowing the rafters at once to slope backwards from the pediment, which might have seemed the simpler arrangement, lies in the necessity for keeping the finishing-point of the thatch, with which the roof is to be covered, some distance backward. Otherwise it would be impossible to give that projection of the eaves over the pediment—best shown in Fig. 2—which is most valuable, as affording shelter to the wood-work in that part, and indeed to the interior of the summer-house generally.

Fig. 7 shows the manner in which the ends of the rafters are to be sawn ; and after these have been fixed, laths will have to be nailed across them. Any rough rods, if tolerably straight, and about an inch and half thick, will do. They should be placed some 5 inches apart ; and a rather thicker one should be fixed at the bottom ends of the rafters, to support and well prop-out the eaves.

About 16 or 17 inches from the ground will be found a good height for the seat. The method by which it is supported is shown in the illustration, Fig. 1. It should be made of an inch board, about 16 inches wide. As shown, it is covered and concealed by split rods, fixed closely side by side with brads. These should be small and smooth, as of hazel or peeled willow. In this design the rods are simply placed in parallel lines : a more decorative arrangement might be adopted—but of this kind of work I shall have to speak more fully farther on. To hide the ends of these rods, as well as the edge of the board, a long split rod is finally nailed along the whole front of the seat.

Between the horizontal and sloping pieces of larch, which form the pediment, the space is filled with open work of small oak or apple branches. The eccentric curves and twistings of these sticks contrast effectively with the straight lines around them.

A finish is given to the four front posts or pillars by the addition of rustic capitals. These are formed by nailing four sticks of large, quartered wood, round the pillars at top, and four strips of smaller halved wood round the bottom of the cap, and fixing fir cones between them with brads.

We have now a tolerably exact description of the wood-work of this summer-house. Some other matters are still wanting to its completion ; such as the thatching and lining of its roof, forming its floor, and making its walls proof against wind. But these processes will be better treated further on, after we have considered our designs for other summer-houses on a somewhat larger scale.

(*To be continued.*)

MAKING AND REPAIRING METAL ORGAN PIPES.

By the Author of "Facts About Organs."

THE excellent directions given in a previous number of this work relating to the arts of soldering and brazing generally, led me, when reading, to think that a slight specializing of them for the use of amateur organ-builders might not be altogether unacceptable.

I do not for a moment expect that many amateurs will attempt to make a stop of new metal pipes, the more so as this presupposes a casting bench and experience in the difficult and indeed *dangerous* art of casting sheet metal. Yet, taking my own experience as typical, they will, I can assure them, save much outlay of capital and *waste of time* by being able to handle the soldering iron. Though I myself never made but one complete metal stop, and fairly "gave in" after commencing a "Double Open" in zinc, I have repaired some thousands of pipes, and saved at least 75 per cent. on each of them compared with the price tinsmiths charge (and not unreasonably) for such "odd jobs."

Some knowledge of the art of soldering is indispensable to the amateur organ-builder ; and, indeed, it is also highly desirable for all who have the care of an organ.

Organ pipes are supposed to be made of variously proportioned compounds of tin and lead, but type metal, antimony, and arsenic enter largely into the composition of the cheaper kinds.

Commencing, therefore, with the general caution to be careful not to melt the pipe in holes by using the iron too hot for the particular composition to be dealt with, I will at once proceed with the *modus operandi.* First, we will suppose that the pipe is split down the seam, or that it is desired to add a short piece to it to lengthen it.

Paint the pieces to be joined for about an inch from their edges with a solution of glue and whiting (*washed* whiting—a pennyworth from any druggist will last a long time); do not put it on too thick or it will crack and peel off when dry.

When *quite* dry file the edges to a bevel of about forty-five degrees, scraping quite clean with the corner of a chisel or a knife. Next, having nicely tinned the soldering iron with resin on a tile or hard brick, rub the clean edges of the metal with a piece of common composite candle. This flux is worth all the chemicals imaginable, with all their unpronounceable names; it will solder almost any metal. Now tack the joint with little drops of solder at intervals, and *slowly* draw the joint, letting the iron barely (if at all) touch the surface of the metal. The joint is now finished, and unless a hole has been burnt, or other mishap has occurred, there is no need to go over it with the file, which is at best but a "tinker's finish." The joints in organ pipes do not overlap, but the edges are brought one *against* the other, and the solder run in the bevel groove between them.

When pipes are of really good metal, clippings from themselves will make the solder. I have for years exclusively used pipes from Henri Zimmermann, of Paris (by the way, his first-quality metal pipes, to which I allude, are cheaper than the same pipes in ordinary metal from many English houses). One or two small pipes of these melted down, or rather, the clippings when cutting down to tune, have kept me in solder for years.

One of the repairs most often needed in an organ is perhaps the most troublesome. I mean the repairing of reed pipes.

Reed pipes being very weak at the point where they join the block, have an ugly proclivity for snapping off there. Suppose we have one broken off close to the block, the following is the way to proceed in repairing it. First remove the wire, reed, tongue, and wedge, and put them carefully aside. Next place the block upside down on an iron fire shovel on the fire to melt out the old solder in it. Cool the block and clean the cavity where the tube fits it. Heat it again very hot and place it in a vice or tablescrew, hold the *tube* in its normal position (having previously sized its extremity as before directed, and filed the tip bright). Now run solder all round into the countersunk cavity of the block, using a hatchet-shaped soldering iron, applying a strip of solder to the point of the iron, the bright surfaces having previously been greased with the soft composite candle. The block being hot will cause the solder to run or float all round the lip of the body, and a very solid joint will be effected. If the block were cold, the solder would chill as fast as put on, and if it did happen to bind the two parts together, it would only be by its getting a hold in any irregularities the surfaces might present, much as "stopping" in a hollow tooth, not by having incorporated itself with both parts in one continuous mass, as is the case with all real soldering. Exactly the same course must be followed in the case of zinc pipes, except that sizing with glue and whiting may be dispensed with. If it be desired to make a zinc pipe, or to lengthen one out, the zinc must first be softened over a fire of *shavings* (not *coal*) till all the "spring" is taken out, and it crackles when bent.

Organ-builders generally use iron soldering bits, but the amateur will find a copper bit more handy unless very proficient in the art of soldering.

HOW I BUILT MY FIRST COIL.

By R. WILLIAMS.

II.—THE BASE AND CONNECTIONS—COIL WITH REGULATING TUBE AND CONDENSER.

THE next part to be considered is the base. It is made of $\frac{1}{2}$ or $\frac{3}{4}$ inch mahogany, and is 4 inches wide by 6 inches long; it is nicely planed, sand-papered, and polished; and, if possible, should have a nice ornamental border of about half an inch all round it. The hammer, or contact-breaker, will next engage our attention; it may consist either of a piece of sheet brass $1\frac{1}{2}$ inch long by $\frac{3}{8}$ inch, tapering up to $\frac{1}{4}$ inch at the point, as in Fig. 4, filed very thin so as to give it a spring, or a piece of the mainspring of a watch about $\frac{1}{8}$ inch wide and $1\frac{1}{2}$ long. To the small end of this spring is soldered a piece of soft iron, $\frac{3}{8}$ inch in circumference and about $\frac{1}{8}$ inch thick, as shown in Fig. 5. A good substitute is the head of a nail such as is used for shoeing horses, cut off and filed to about $\frac{1}{8}$ inch in thickness.

Your platinum foil will now be required. Cut off a small bit about a $\frac{1}{4}$ inch square, and solder it to the back of the spring about $\frac{1}{8}$ inch from where it joins the iron. You will notice that the iron is on the front of the spring, the platinum on the back, or opposite side. Great care must be taken in soldering on the foil as it is so thin. First put a little powdered resin on the place, lift a small particle of solder with your bolt, and spread it on the place where the platinum is

to be. Now take your platinum, put it on the place and gently press it down with your bolt, when it should be firmly soldered to the brass. Perhaps it would be better to get a tinsmith to do this little job for you, if you know one. You must now take a piece of stout sheet brass, about 1½ inch long and ⅜ inch wide, and bend it at right angles, as in Fig. 6, so that A will be 1 inch long and B ½ inch long. About ¼ inch from the top of A a hole is drilled and threaded so as to admit of a screw working in it. I may remark here that you can procure contact-breakers complete, tipped with platinum, and far better than you could make them, from any electrician; Messrs. H. and E. J. Dale supply them from 4s., but this would add to the expense. A common screw will not do here; a good substitute will be found in the screws that hold on gas and lamp glasses, and the part in which the screw works can be used when soldered to the brass strip A over the hole above-mentioned: this will save you the labour of getting a thread in the brass, it is also firmer. A hole is also bored through the part B to allow it to be screwed to the base. Now take the screw I mentioned as working in A, and drill a small hole in the point of it, to admit the end of the platinum wire. Now put in the end of your wire, carefully solder it to the screw, and cut off the excess of wire about ⅛ inch from the end of screw.

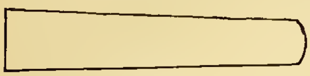


FIG. 4.—HAMMER OR CONTACT-BREAKER.

We will now return to the base (Fig. 7). You will require four binding screws of small size. A hole is bored right through the base about ⅜ inch from each corner, and the binding screws screwed into it. The coil is now to be screwed to the base-board, and for this you will require two small brass screws about ⅝ inch long, and as thin as you can get them. Now lay your coil on the top of the base-board, about 1¼ inch from one end and exactly in the middle (longways), mark the places and then remove your coil. Bore two holes right through the base, one at each spot where the coil rested. You now screw on your coil to the base, putting in the screws from the bottom of the base-board and driving them a short distance into the ends of the reel. Keep the end of the coil with the primary wire to the end marked A and the fine wire to B. Now bore two holes at each end close to the ends of the coil right through the base, and pass the free ends of your wire down through. You now take a piece of stout brass wire, or rod, about ¼ inch thick and 1 inch long, and, with a very fine saw, cut it down through the middle for ⅜ inch.

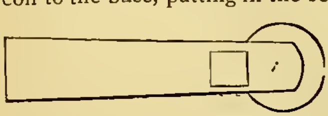


FIG. 5.—HAMMER COMPLETE.

Now bore a hole through the base at C in Fig. 7, so as to admit the wire tightly, put it in and push it down and through, leaving about ¼ inch above the base of the cut end. The point C is in exactly a straight line with the end of the coil and about 1½ inch distant from the core, just about the edge of the base. Take the spring already referred to and insert the end of it in the cut in the piece of brass, it should be a very tight fit, and move it until you get the face of the iron head exactly opposite the core and about 1/16 inch distant. Then take the piece of brass bent at right angles with the screw in it, and screw it on to the base with a round-headed screw about ¾ inch long, in such a way as that the platinum point of the screw (when the screw is about half screwed through) will just touch the centre of the platinum foil on the back of the spring, as in Fig. 8, and your coil will be finished except the connections. Of course if you buy a contact-breaker, as I mentioned, the fixing of it will depend on the style. Now turn your coil over so as to make your connections beneath the base, and it will be somewhat as in Fig. 9:—A, B, C, D, ends of binding screws; E, end of screw by which the back part of spring is screwed to base; F, end of rod with cut supporting spring; G and H, ends of primary wire; K, K, ends of secondary or fine wire.

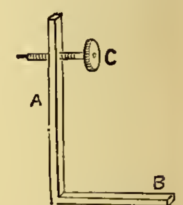


FIG. 6.—REGULATING SCREW.

Now twist off the cotton from the ends of wires, K, K, and solder them to the ends of the binding screws, B and C. Next solder the end of wire G to binding screw A, and of wire H to the end of rod F; join D and E by a short piece of wire soldering one end to each, and your coil will be complete except the handles and battery.

I subjoin a list of prices of wire, etc., which may be procured from F. E. Becker & Co., 34, *Maiden Lane, Covent Garden, W.C.*, who sends following prices:—

Wire No. 24 cotton covered ...... 3s. per lb.
„ „ silk „ ...... 5s. „
„ No. 36 cotton „ ...... 8s. „
„ „ silk „ ...... 12s. „

Platinum wire and foil 1d. per grain, but 6d. worth of both (together) is enough.

Binding screws, with nut...... 3s. per dozen.
„ „ common ...... 1s. 8d. „

Messrs. H. & E. Dale, 4, *Little Britain, E.C.*, supply:—

Contact-breakers .... from 4s.
Regulating tubes .... from 1s. 9d.
Cores, ready-made................ from 1s. 6d.

The coil will now be complete except the handles. To make them, procure a pair of empty cartridges, large size, centre fire, with the caps extracted. Now

take a pair of corks that will fit tightly into them, put a little gum or glue on the corks and force them in until they are flush with the end of the cartridge, taking care not to split the paper. Next cut a strip of tinfoil about $\frac{1}{2}$ inch longer than the cartridge, coat one side with gum and roll it tightly round the cartridge, having the surplus half-inch at the end where you inserted the cork; fold this down all round so as to hide the cork. Take a yard of No. 18 or No. 20 wire, and solder one end to the brass part of cartridge, and twist the loose end into a spiral round a ruler to make it take up less room. The other one is made in exactly the same manner. This finishes your coil, put the ends of the wires from your battery into binding screws A and D, Fig. 8, and the ends of your handle wires into B and C. Move your regulating screw C in Fig. 6 until you see a spark pass between it and the platinum of the hammer, and the coil will begin working, buzzing like a swarm of bees.

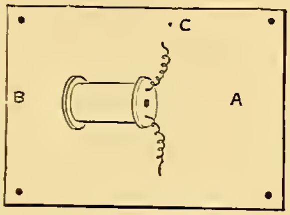


FIG. 7.—BASE OF COIL.

We will now proceed to the description of a coil with a regulating tube and condenser. The ends are the same as in the other coil. Take a thin brass tube, such as is used for the barrel of a toy gun, $2\frac{5}{8}$ inches long by $\frac{3}{8}$ inch, and a strip of thin grey paper $2\frac{1}{2}$ inches wide. Cut it long enough to go twice round the brass tube, roll it once round, and mark it with a pencil where the paper meets. Take it off, and with your glue brush go over the remainder up to the marked line, then carefully roll it round your brass tube. You will now see that when the brass tube is withdrawn, the paper will form a tube of itself. Take the two ends of your coil, and glue one on to each end of the paper tube, and lay it aside to dry.

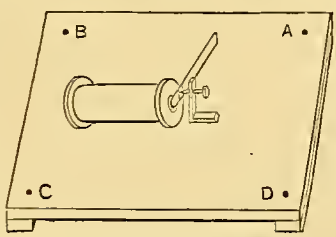


FIG. 8.—ADJUSTMENT OF COIL AND PLATINUM OF HAMMER.

The next part is the core, which is made in exactly the same way as mentioned before, only it is made this time to fit your brass tube, so that the tube may slide upon it. The wire is also wound in the same way as previously; but you must push your brass tube inside the paper one when you begin to wind, as the paper would collapse and be spoiled. The contact-breakers, etc., are the same, so are also the connections of the wire under the base. The base itself is slightly different in construction, although the same size. It is made of $\frac{7}{8}$ inch mahogany, with an ornamental border, and planed and polished as formerly. The bottom of it is hollowed out $\frac{1}{2}$ inch deep by $4\frac{1}{2}$ inches long by 3 inches broad, thus making a kind of box to receive the condenser.

The core is fixed into the inside of the paper tube with small pieces of wood about $\frac{1}{8}$ inch long, so that the brass tube will slide upon it. The brass tube has a small knob, or ring, soldered to one end so as to draw it out. The core projects at one end for the hammer to strike on, as previously mentioned, and the pins, which hold it firm, are first dipped in glue before insertion.

FIG. 9.—CONNECTIONS BENEATH THE BASE.

The condenser is now all that is required to finish. It is made of a number of sheets of grey paper and tinfoil alternately. The paper is cut $4\frac{3}{5}$ in. long by 3 in. broad, and the tinfoil $4\frac{3}{8}$ in. long by $2\frac{1}{2}$ in. broad. You will require about thirty [of grey paper and twenty-five of tinfoil. Now take] a sheet of paper and lay upon it a sheet of tinfoil, the foil projecting over one end about $\frac{3}{8}$ inch, then lay on a sheet of grey paper above this, and put a sheet of tinfoil upon it with $\frac{3}{8}$ inch of it projecting at the opposite end from the first one, as in Fig. 10, in which P is paper, T first tinfoil, F second tinfoil. Continue thus putting on the paper and tinfoil alternately, always making the projection at opposite end from the one you did last. So that at one end the tinfoil would run, if numbered, 1, 3, 5, 7, and at the other 2, 4, 6, 8, and so on, finishing, as you began, with a sheet of paper.

See that your paper is free from pin-holes. Cartridge drawing-paper is preferable to grey. Take the whole gently up and place it in a plate of melted paraffin, allow it to soak in for several hours until it is thoroughly saturated. When this is done, take it out and lay it between two flat boards and subject it to a good pressure for an hour or two, either under heavy weights or in a letter press. When you remove it, proceed to solder all the ends of the tinfoil projecting from one end to each other, and the same with the other end. This is very delicate work

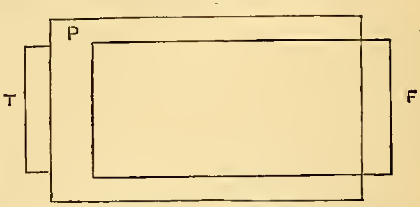


FIG. 10.—CONDENSER.

and your soldering-iron must not be too hot. Next solder a small piece of No. 20 wire about 3 inches long, one to each end of the foil. The other ends of these wires are soldered, one to connection E, Fig. 9, and the other to connection F under the base. An extra sheet of grey paper is placed on the top of the condenser, and it is then gently pressed into the box formed in the base. Take care that the surplus of the condenser wire does not touch any of the other wires.

A piece of thin board is now placed over the bottom and screwed down, to prevent the condenser falling out. Four small wooden feet are glued to this, and your coil will be complete. A bichromate battery is the most convenient for driving a small coil.

If I have not been explicit enough in my notes upon the method of building a small coil, I shall be happy to answer any questions that may be put to me through the medium of "Amateurs in Council."

HOUSE PAINTING AND PAPERING.

By GEORGE EDWINSON.

III.—HINTS FOR COUNTRY READERS—FINISH OIL COLOURS FOR SERVANTS' BEDROOMS, ETC.

IN London, and in all cities and large provincial towns throughout England, the amateur can purchase all the materials he may require from an oil and colour store within a stone's throw of his residence; but less favoured readers residing in the country, far removed from towns, and those living in far distant colonies, may not be able to get jellied size and prepared whiting, although the raw material out of which these are made may be close at hand. To such the following hints will be useful.

The common whiting used as the basis of all preparations for distempering is made from finely-pulverized chalk (natural carbonate of lime), ground in water to which a little alum has been added. The coarse rough particles are removed by levigation; that is to say, the thick milky liquid is drawn off after the mixture of crushed chalk and water has been stirred up together, and this milky liquid is allowed to rest in a pit or some receptacle until all the fine particles of chalk have subsided. The clear water is then drawn off, and the precipitate dried until it is in the condition of a thick paste or dough, when it is made into balls and dried. Where chalk is scarce, and limestone or marble abundant, lime, procured by burning these stones in a kiln, may be used as a substitute for whiting in making up a distempering mixture for walls and ceilings. In that excellent guide for amateurs, "Every Man His Own Mechanic," the following directions are given for making whitewash from lime:—"Take a barrel, or other suitable cask, clean and water-tight, and put into it half-a-bushel of lime. Slake it by pouring water over it, boiling hot, and sufficient in quantity to cover the lime to the depth of five inches, and then stir the whole briskly until the lime is thoroughly slaked. When the slaking has been effected, add two pounds of sulphate of zinc dissolved in water, and one of common salt. These ingredients will cause the wash to harden, and prevent it from cracking, which gives an unsightly appearance to the work." In the same page the author warns his readers not to expect distemper or whitewash to "stand," *i.e.*, remain permanent, in a damp position, because "the damp *kills* size, and deprives it of its binding power." Salt in whitewash has a tendency to absorb moisture from the air, and my adviser informs me that salted whitewash never keeps its proper tint, but this changes with the weather. He therefore objects to the use of salt in whitewash, and recommends the following mixture:—Proceed as above directed to slake the lime, then add two gallons of beer dregs and half-a-gallon of boiled linseed oil to every half-bushel of lime, and stir in the usual quantity of blue-black ground in whitewash, or other desired colour, to tint it. Where boiled oil cannot be obtained, dissolve three pounds of tallow by stirring it well into the hot lime. Where blue-black cannot be procured, any other vegetable black may be used as a substitute. Sulphate of zinc, or white vitriol, is made by dissolving the metal zinc in dilute sulphuric acid (oil of vitriol and water), contained in a stoneware jar, until the acid ceases to dissolve any more metal, then heating the liquid until all the water has been driven off in the form of steam, and a white powder remains. It will be well to know that coral, shells of fish, and also those of birds' or fowls' eggs, all contain lime, which can be converted into its soluble form of carbonate by making those substances red-hot. Size can be made by first soaking for many hours in water the cuttings or parings of raw hide, white leather, glove leather, parchment cuttings, or any untanned animal cuticle, and then boiling them for some hours longer. The best size for distempering is that made by boiling well-soaked parchment cuttings for several hours, skimming and straining the liquid, and adding three ounces of alum dissolved in water to every pailful of liquid. This, when cold, assumes the form of jelly—the best jellied size. Skim milk is used by some persons as a substitute for size in distempering. Glue, dissolved in hot water and thinned with water, is also another substitute for size. A preparation of size and whiting is used by some persons as a preparatory coat

on old wood before applying the ordinary paint or oil colour.

This practice of clearcoling the wood has its proper use in certain situations; but it is a bad practice to thus cover up smoke, grease, and other dirt on old painted woodwork, and it is still worse to thus hide damp wood. Other persons recommend the use of a preparation for the removal of old paint altogether, instead of rubbing the surface down with pumice-stone and cleaning it with water. Now, the use of oil colour as a paint is intended not only to beautify the surface of the wood (indeed, it is a questionable taste that prefers a painted surface to that of clear varnished wood, showing, as this does, its beautiful grain); the paint is put on to act as a preservative of the wood, but to do this it must penetrate the pores of the wood. This it cannot do if the pores are choked with dirt and grease, nor will oil enter where water is present, or where the pores are already choked with a deliquescent salt, such as potash. This potash (American potash, or caustic potash, or an equivalent in the form of potash and quicklime) forms the basis of most paint removers, and these leave behind them a damp surface incapable of retaining subsequent coats of colour under the changes of our humid climate. When damp gets into wood, and is shut into wood by a coat of paint, rot commences, and all subsequent coats of paint only disguise but never stop rot, for this goes on under the coat of paint. If, therefore, we wish to preserve wood in a sound condition, it must never be painted damp nor washed with any water colour before putting on oil colour, nor may any decayed parts be disguised by a coat of paint. To make a good job of a window-frame, all decayed wood should be cut out and the holes stopped before the first coat is put on. Where the decay is extensive, new wood must be put in, and this must receive a coat of "priming" before it is painted. This part of the work will receive attention further on, when we shall have some new wood to paint.

It frequently happens that bedrooms only require to have their ceilings whitewashed and the walls repapered. The paintwork only needs a little cleaning to make the room respectable, and it will be well to know how to clean the paint quickly and well. The following methods have been recommended: 1. Take one ounce pulverised borax, one pound shavings of best brown soap, and three quarts of water. Put the soap and borax into the water, allow it to simmer until all the soap has been dissolved, stir it frequently, but do not allow it to boil. Apply it to the paint on a piece of old flannel, and rinse with clean water. 2. Procure a piece of clean flannel, some clean water, and some powdered whiting; wring the flannel out of the water, dab it in the whiting, and with this rub the paintwork until it removes all the dirt and grease, then wash off the whiting with clean water, and dry the paint by rubbing it with a soft cloth. This process is said to be a safe one for any kind of paint, since it does not destroy the gloss on the most delicate tints. 3. The old time-worn method is to wash the paint with a soapy flannel dipped in water containing a little soda to kill the grease. Makers of paint-removers recommend their preparations for *cleaning* paint; but I have found the best paint-cleaner to be a home-made preparation of soap and potash made for me by Mr. S. R. Bonney, of 3, *Albion Terrace*, *Lewisham*. It is in the form of a slimy liquid, and is first mixed with a quantity of water, then applied to the dirty paint on a piece of flannel. It quickly removes all dirt, and when washed off leaves the paint bright and clean. I do not know the exact proportion of its ingredients, but the maker informs me that he will forward a sample tin to any amateur in return for six penny stamps. Hudson's Extract of Soap is good as a paint-cleaner.

Now to resume where I left off in my last article. We have cleaned and clearcoled walls and ceiling, distempered the latter, cleaned, repaired, and "stopped" all the woodwork around the room, taken off all locks and similar fastenings, repaired the windows and sash-lines, and have put on the first coat of colour. This should now be firm and dry, and all shrinkage of the stopping should have ceased. Armed with a kind of scrubber, made from a piece of wood 4 inches by 3 inches by 1 inch, with a piece of glass-paper wrapped around it, we must go over all the flat surfaces of the newly-painted work, and lightly rub down all rough spots, special attention being paid to those parts that have been stopped, the object being to prepare a smooth ground for the next coat of paint. With strips of wood of various shapes, chisel and round pointed, and smoothly-folded glass-paper, every part of the woodwork may be reached. The curved part of mouldings should be smoothed with the glass-paper wrapped around the thumb or finger, but we must avoid folding the paper so as to form creases and angles, and thus scratch the surface of the paint. When all has been rubbed down smooth, we must next take up the dusting-brush and remove all dust from the surface of the paint before we proceed to lay on the next coat.

It will be also well just here to pause for a few minutes, and think how we shall set to work in putting on the colour—where we shall begin and where finish, and how we shall treat the different parts. Those hints should have been given in my last paper, but it will not be too late to consider them now. For instance, before we begin to paint the window-sashes and frame, it is well to have a plan thought out before-

hand, to avoid marking the wet paint and soiling the fingers. First, then, throw up the bottom sash as far as it will go, then pull down the top sash, and paint the bottom rail inside (outside work is a separate job); then push the top sash up again and paint the part in which the bottom sash works, together with the parting bead and front bead on both sides. Then draw down the bottom sash, and paint the corresponding parts above it. Then pull down the top sash a few inches, paint the top rail, push up again, finish the top sash, then the bottom sash, and finish off with the frame, working inwards towards the room. Let all strokes of the brush be directed lengthwise of the part to be painted; do not overcharge the tool with colour, place it firmly in the corner of each frame and draw it along (without smearing the glass) from left to right, then from the right corner to left, then from top to bottom, and so on, reversing the stroke with a firm, steady hand, and giving a light stroke over all to form a smooth surface. If any of the paint should get on the glass, wipe it off at once with a bit of linen rag wound around the tip of the finger, and keep this rag near at hand.

We will now turn our attention to the doors of the cupboards or presses, and also the door of the room. If there are mouldings to the panels, do these and the edges of the doors first, then paint the top panels, next bottom panels, then top and bottom centre styles, then top rail, next lock-rail, then bottom rail, and finish off with outside styles. A reference to the illustration, Fig. 23, will enable the reader to understand the names of parts of a door.

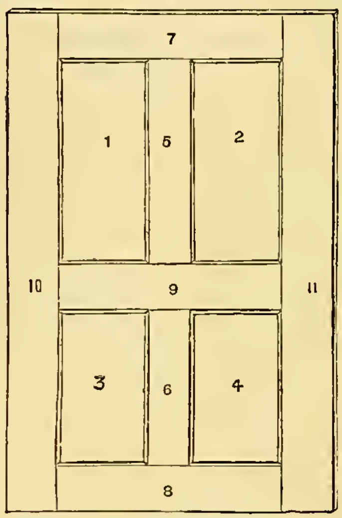


FIG. 23.—DIAGRAM SHOWING DOOR AND ITS PARTS.

1, 2, Top Panels; 3, 4, Bottom Panels; 5, Top Centre Style; 6, Bottom Centre Style; 7, Top Rail; 8, Bottom Rail; 9, Lock Rail; 10, 11, Outside Styles.

We must next consider the arrangement of shade, if it is intended to make any difference in the shades of panels, styles, rails, and mouldings. Some persons prefer to leave the finished work in one uniform shade or tint; others prefer panels and flat surfaces painted with a light shade, and the styles, rails, and mouldings picked out with a darker shade of the same colour. In both cases the arrangement is merely a matter of taste, and the latter entails very little additional trouble, since both shades can be mixed in one pot, and applied one after the other. The second or finish coat for old work, technically known as "third coat oil colour," is composed of white lead, thinned with raw linseed oil alone, and shaded with a pigment made of equal parts raw umber and yellow ochre ground in oil; to this is added driers in a slightly larger quantity than used in the previous coat. This coat will dry with tolerable rapidity, and with a glossy surface. If we wish it to dry "flat," or without gloss, we must mix some turpentine with the oil; even a little will tone down the gloss or shiny appearance of the surface. The pigment above mentioned will give that peculiar shade known as "brown stone colour," the shade being deeper in proportion to the quantity of pigment used. The approved shade is obtained by mixing trial samples; that is to say, a small quantity—say a cupful—of the prepared lead paint is taken from the bulk, and the shading pigment is added in small quantities, with frequent stirring, until the depth of the desired shade is shown when painted on a board. The quantity of pigment required to produce the shade is noted, and a proportionate quantity is stirred into the bulk. The shade first to be secured is that for the panels and plain parts of the woodwork; when this has been applied, more of the shading pigment must be added to the remainder until the darker shade required for the styles, rails, etc., has been obtained. Proceed in making up this colour after the same method as that explained for making up the first. Use the same quantity of white lead, and mix this with a volume of oil equal to that of the mixture of oil and turpentine used at first; add the driers in a slightly larger quantity than at first, then shade to taste, and strain. About one pennyworth of the mixed colouring pigment will be sufficient for a gallon pailful of paint. If a grey tint should be preferred to stone colour, it can be got by a mixture of two parts ultramarine blue to one part of rose pink or of vermilion.

Locks and ironwork to be painted should first receive a coat of the turpentine second colour, and when dry be finished with Japan black or varnish black. The latter is made by darkening oak varnish with a vegetable black. Brunswick black is not suitable for this purpose, because of its sticky condition when applied to cold metal, and it is not convenient to heat locks before applying the black.

When the two or three top bedrooms have been painted, we shall find (perhaps) a little colour left in the pot or pail, and this we may wish to preserve for a future job. If we put it away in its present condition for one night only we shall find its surface

covered with a film or tough skin, composed chiefly of oxydized oil and colouring matter; to get this off and put the paint in condition for further use, we shall have to strain it and will then find its bulk considerably reduced, thus showing some loss of material. To avoid this loss it is well to always cover the paint with water when we leave work at night, and, in the case of residues, empty the paint-pot or pail, pouring the paint into a small can or pot, and not only fill the small pot with water, but also fill the larger one with water and leave it there until it is again wanted. It is also advisable to gently press all the paint out of the brushes (this can be done by resting the bristles on the side of the paint-pot, and gently passing a smooth stick down over them,) and place them in water during the night, or for a day or two until again required. But if the date of their future use is uncertain, it is best to work out all the paint in turpentine; or, in other words, to well wash them in turpentine, dry them, wrap them up in old rag to protect them from dust, and place them safely away in the tool-box. If brushes are allowed to remain for a long period in water, their bristles rot, and they then become useless.

I have entered largely into the details of mixing, making up, and laying on the water colour for distempering and the oil colour for painting servants' bedrooms, not only because those details will be useful to us as guides for the proper performance of more advanced portions of house-painting, but also because, in many cases, no other shades of colour will be used in small cottages than those I have mentioned, for in most small houses the same well-known stone colour, or some shade of drab or of grey, prevails on the woodwork in all the rooms, whether designated bedroom, parlour, or kitchen; and in this class of houses, the homes of our labouring poor, contentment reigns with clean white distempered ceilings.

Readers who may be fortunate enough to possess our Editor's valuable work (already mentioned in this article) will find a full table of "Simple Colouring Substances" on p. 714, and another table of "Compound Colours" on p. 715. By the aid of these tables any desired shade of colour in oil pigments may be obtained.

When the paint is dry we shall be able to hang the paper; meanwhile we may measure the room, estimate the quantity of paper required, fix upon the quality, and select the tint and pattern. The usual width of English wall-paper is 21 inches, and the rolls of paper, termed "pieces," are 12 yards long; to estimate the quantity of paper required to cover the walls of the room, we shall require to know how many widths of 21 inches each will cover the distance around the room, and how many lengths of paper equal to the height of the room are contained in one piece or roll of paper.

Now, if the height of the room, from skirting to cornice, is 9 feet, we shall easily calculate that one piece will furnish four lengths of paper, and those four lengths will cover a width of 84 inches, or 7 feet; then, by finding out how many widths of 7 feet there are in the compass of the walls, we may estimate the number of pieces of paper required to cover them. It is usual to measure a room with a stick 21 inches long, to omit the spaces occupied by doors and windows, estimate the number of lengths that can be cut out of one piece, allow one piece over in every seven for waste, and another piece for repairs; but if we adopt the method first mentioned, we shall have enough paper for all practical purposes.

In choosing a pattern for a bedroom, avoid too stiff geometrical repetition; let the style be one of a quiet, restful, conventional character, and let the tint be cool for a room of a sunny aspect, but with a little warmth in it for those facing the north. Avoid brown, bright green, and staring patterns. I must return to this subject in my next article, which will be devoted to the best methods of hanging wall-papers.

(*To be continued.*)

RUBBER STAMP MAKING.

By a Member of the Firm of HENRY J. MARTIN & Co., Cork.

IT cannot be said that I come unknown and unintroduced to my readers, for, if they will look at their October, 1882, number, on page 526, under the heading of "Notes on Novelties," our Editor introduces my firm to all who subscribe to his journal, by recommending them to purchase the products of an invention sold by us, which, we may add, has since made wonderful way in England. To "begin at the beginning," as we Irish say, my firm has been asked by our Editor to write a series of Articles, describing the manufacture of rubber stamps, for the information of the readers of the Journal he conducts, and in which is to be found very valuable instruction in all departments of AMATEUR WORK.

The method of making that beautiful stereotype we call a rubber stamp has long been kept a trade secret, known only to the initiated, who are not at all, as a rule, disposed to part with their information by any ordinary process of question and answer; indeed, on the contrary, the makers of rubber stamps are retentive of their secret to the last degree, imparting it only when receiving handsome remuneration.

In these articles I propose to give the amateur a complete description of the process we employ, show-

ing him, step by step, how to make a rubber stamp, from the setting up of the type to the mounting of the finished vulcanised product to that piece of brass, which adds so to the appearance and durability of the caoutchouc. By following with ordinary care and exactness the instructions which will be given, any person can easily make a perfect stamp of any dimensions from the name-stamp of one short line to a large oval the size of a quarter of this page.

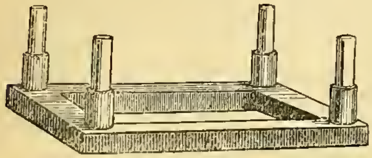


FIG. 1.—CHASE.

In order that the amateur may have his work simplified as much as possible, I will describe the process from the very commencement, avoiding trade and technical terms as much as possible. Briefly, it may be summed up as follows :—Ordinary printer's type is first "set up," or arranged as if for printing purposes; a plaster cast is then taken from the type, which, when prepared in its turn, is made to form a mould into which the prepared rubber is forced, and, when vulcanized, makes your rubber stamp all complete, ready to be mounted, etc., for sale.

The apparatus proper which is necessary for the foregoing manipulations, and which is employed by my firm, is made of the best quality of polished iron, and consists of five distinct parts, not including two screws 2½ inches long; it weighs about 7 lbs., is very strong, simple, and easy to work (manual skill being reduced to a minimum), cannot get out of order, and is ready for use at once. It consists of a dry-heat improved vulcanizer, a chase of special design, a press, moulding plates, and a frame.

The great nicety of fitting required in all its various parts, the amount of exact planed iron surface necessary for its satisfactory production of exact rubber stereotypes, and the expense and difficulty of procuring castings, not to mention the trouble of making patterns for the founder, have induced my firm to undertake to supply at a special rate, to the readers of AMATEUR WORK *only*, a complete rubber-stamp-making outfit, as detailed above, for the very low price of 17s. 6d. Intending stamp-makers would do well to procure this outfit *at once*, as it must be remembered that this apparatus is the result of very skilled workmanship and of matured experience, and, furthermore, that these articles will describe the stamp-making process *only* as in conjunction with it. My firm will return any purchaser's money if he is not *perfectly* satisfied with the outfit. The very moderate price charged brings it within the means of amateurs who have not much money at their command, and who are, perhaps, desirous of increasing the same by every honest effort. I may mention that it is with this object in view that my firm offers the outfit for a sum which leaves them a very diminutive profit, especially when it is considered that not only will it do all that an amateur requires of it, but when I state that it is largely employed by the trade itself, in preference to any other, for its convenience, simplicity, and cheapness. I will, then, presume that the amateur has got the necessary outfit, and is ready to commence work.

One or two "founts," or sets, of ordinary printer's type will now be required; the amateur may, for a beginning, buy say a "2 A 3 a" fount of fancy and a "5 A 6 a" fount of plain pattern from any dealer in printers' materials, such as Squintani, etc. These will be ample for him to start with, and according as he progresses he may procure other patterns. At this stage it may be stated that it is as easy to produce the most intricate pattern in rubber as a simple straight line, so that the amateur may, if he chooses, indulge his taste for fine curves and delicate hair-line embellishments to type to any extent.

The process of manufacture of an ordinary name-stamp will now be entered into; the instructions will refer just as well to a stamp made up of several hundred letters. Suppose we take the name

James Smith.

The type is to be "set up," or arranged in the chase, Fig. 1, which must be placed on a perfectly level surface, such as piece of planed iron. Be careful that a blank is put between the two words, *James* and *Smith*, and that a full-stop follows the surname. Of course, it is understood that the type reads *backwards*, and as mistakes are liable to occur in leaving out or putting in wrong letters, which would afterwards involve a great waste of time, the system my firm adopt is, when all the wording in a stamp is arranged, to take a small mirror and hold it over the type at such an angle that the eye meets the reflection of the letters, which may now be easily read off and errors corrected.

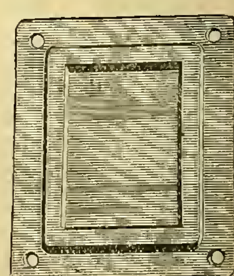


FIG. 2.—FRAME.

This being done, the type must be wedged tightly in the chase by spaces and small wedge-shaped pieces of wood called *quoins*, which the amateur may easily make to suit his own requirements, or procure at the same house that he bought his type. A level piece of hard wood, say four inches square, is now taken, placed on the face of the type, and moved about, gently tapping it with a mallet at the same time, the

object of this operation being the smoothing down of all inequalities on the surface of the type, and making it as level as possible.

Next take a 3-ounce phial, and put into it 2 ounces of spirits of turpentine and 1 ounce of benzoin. Dipping a small brush into the mixture, apply it to the type, taking care that too much does not run from the brush, filling up the smaller crevices of the letters.

Laying the chase and its contents aside for the present, the frame, Fig. 2, is now taken, and the face, frame, and inside sides of the frame are lightly smeared over with the same mixture, which prevents the plaster cast adhering to it—as well as the type.

The plaster is now prepared by mixing in a cup, or other convenient vessel, say, 2 ounces of the *best* plaster of Paris and 1 ounce of French chalk, with enough water to form a paste, until it is of the consistency of putty, working it well with an ordinary knife, and taking especial pains to leave no lumps or unmixed plaster in the mass. Put the plaster into the frame, until it is quite full and inclined to run over the side, then take a knife, placing the back on the top edge of the frame, run it backwards and forwards several times, so that all the superfluous plaster may be removed, and the surface left level with the sides of the frame. The plaster should now present a level white surface, perfectly free from holes or lumps. On examining the edges of the chase and frame a letter "C" will be found punched into the metal for register, and now, taking the frame, *just before* the plaster gets hard, press it evenly and steadily, frame downwards, on the chase, the four uprights in the latter entering the holes in the former, the plaster meeting the type, and sinking into it until stopped at the proper distance by the shoulders turned on the uprights.

In two or three minutes, when the plaster has hardened sufficiently, gently lift the frame, the plaster still filling it and adhering to it, off the chase, and put it into an oven to dry. In order that the process of evaporation may proceed as rapidly as possible (for the demands of business are pressing) the frame is fixed on its own plate by means of four iron pegs projecting from the former, and fitting tightly into corresponding holes in the plate, so that after the plate, frame, and plaster have been in the oven, say, six or seven minutes, by inserting the blade of a knife between the frame and plate, the plaster and frame come away together, and being replaced in the oven a much larger surface for evaporation is left exposed, and the water in the plaster, being rapidly converted into steam, the plaster is soon dry. But it must be *perfectly* dry, and not a drop of water in it, for our purpose; and the way my firm test the cast is to take it from the oven, and hold a piece of glass over it. If the plaster is still moist, steam is emitted, and condenses, by a well-known physical law, on the glass in drops; the absence of these drops may be taken as a sufficient indication that the plaster is ready.

I now leave the amateur to satisfy himself on this point until he gets my next article, in which the interesting process of stamp vulcanization will be thoroughly explained, for, I believe, the first time in England, for the benefit of my readers. Should any difficulty be met with in procuring type, my firm will send a complete fount, on receipt of 6s. 6d., specially made for rubber printing.

(*To be continued.*)

A HOUSE FOR DOLLY.

By THE EDITOR.

I.—THE CARCASE, AND HOW TO MAKE IT.

FROM time to time various correspondents have expressed a strong desire to have instructions for building a doll's house given in AMATEUR WORK, and from time to time, accordingly, I have promised that the information asked for should be given without unreasonable delay, relying on the offers of one or two volunteers who proposed to do all that could be possibly desired in this special direction. Being disappointed myself in not receiving the proferred papers, I have been compelled to disappoint my correspondents who have written again and again to reproach me for my shortcomings; and as I dare not on any account whatever keep them waiting any longer, I must endeavour to meet their wishes, regretting very much that I am obliged to ask them to take the instructions they require from myself instead of from others who might have imparted more novelty and freshness of treatment to the subject than I may be able to give to it.

No amateur who is possessed of average skill as a carpenter and joiner, will thank me for describing the regulation doll's house of the toy-shops, beyond which, as far as I am aware, nothing of higher pretensions has yet been attempted: it will, however, be necessary to turn our attention to it for a few moments.

The ordinary doll's house consists of a box, divided horizontally into two compartments, surmounted by a couple of boards, nailed on to two triangular gable ends, and having a movable front, fitted with an imitation door, and pierced for five windows, one at top and bottom, on either side, and one above the door. When it is desired to gain access to the inside, the entire front must be removed, and when this is taken away there is nothing in the box-like structure that

possesses much resemblance to a house, the roof excepted, for there are no windows in it, and all the minor accessories of window curtains, poles, blinds, etc., are not found in the interior, because there is no place for them. The chief faults of the regulation doll's house, then are : that the front must be taken off in order to get at the interior ; that there are only two compartments or rooms in it, and that these rooms are windowless, and on this account for the most part cannot be filled up so as to present a tolerably close resemblance to the interior of a prettily furnished apartment. Let us now see what steps can be taken to remedy these shortcomings, and bring the doll's house in closer imitation of the house in which dolly's little owner resides. It is a step in the right direction without any doubt whatever, for all of us—who, after all, are merely "children of larger growth"—will readily admit that the closer the imitation is to the actual thing which is imitated, the more highly it is esteemed, and the greater is the value that is put on it.

If I were a little girl, which I am not, I think that the doll's house which would possess the greatest charm for me would be that which had the greatest number of rooms in it ; or, in other words, I should infinitely prefer a house that would allow of my having a dining-room, drawing-room, kitchen, bedroom, day nursery and night nursery, to the pair of rooms, sitting-room and bedroom contained in dolls' houses of ordinary mould—a six-roomed house, in short, to a two-roomed house ; and as regards my preference, I think I should be quite in accord with the desires of most men and women who live in this extravagant and ambitious age.

I have said that the first fault in the construction of the common doll's house of every-day nursery life—a fault which meets us on the very threshold of the subject—is the necessity that exists for removing the front bodily, in order to get at the interior. When removed, the front must be laid aside, and if not carefully bestowed in some corner of the room, or the cupboard, if there be one in the nursery, there is a chance that the glass may get broken, with the result of cut fingers in picking up or pulling out the broken pieces. To obviate the removal of the front, and, in fact, to do away with the movable front altogether, is one of the easiest things imaginable, and, like the friends of Columbus, when they saw how easily he performed his famous egg trick, many of my readers may wonder how it could be that it did not occur to them before. In saying this, however, I do not assert that I am the absolute originator of the plan I am about to describe, as others may have built a doll's house in this way before, and never made the method public ; still I believe the plan to be original, and I am open to correction if it is not so. Even at the best it is but the adaptation of the old principle of a box with a deep lid, as anyone may see who possesses a box of this kind, and will take the trouble to set it on one end and open it.

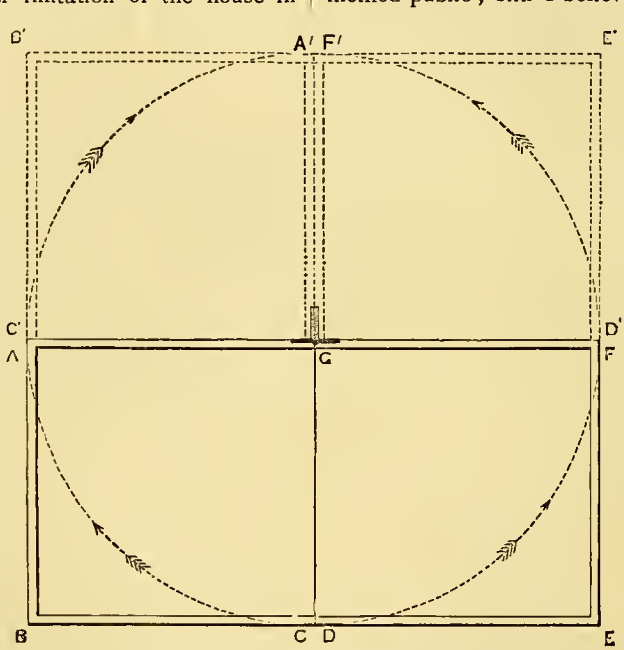


FIG. I.—PLAN OF DOLL'S HOUSE, SHOWING IT WHEN CLOSED AND WHEN OPEN.

An examination of Fig. I will show clearly what my plan is. Suppose A B C G and F E D G to be two boxes without lids, placed on end, and brought together edge to edge, so that the interior of one faces the interior of the other, and forms but one open space within the two boxes, when they are placed together in this manner. In the plan before us, the boxes are supposed to be on end, and the double lines, C B, B A, A G represent in section the front, the bottom, and the back respectively of one of them, and D E, E F, F G the front, the bottom, and the back respectively of the other. Further, suppose these lidless boxes to have the boards which form the back of each connected by hinges, as shown by the solid lines proceeding either way in a horizontal direction from the point G. Here, then, we have our two boxes hinged together, so that one, in fact, forms a deep lid to the other, if either were placed on its bottom ; but, for the sake of continuing the explanation of my system, let us suppose both boxes to remain on end, as originally placed.

Now open the boxes, or rather draw them away

from each other, and note what happens as each turns on the hinges that connect them. Before any attempt is made to open them, the interior is entirely concealed from view by the sides, B C, D E, which, when they are in one and the same straight line, *form the front of the doll's house.* As the boxes are drawn apart, and turn on the hinges, the point A travels along the dotted

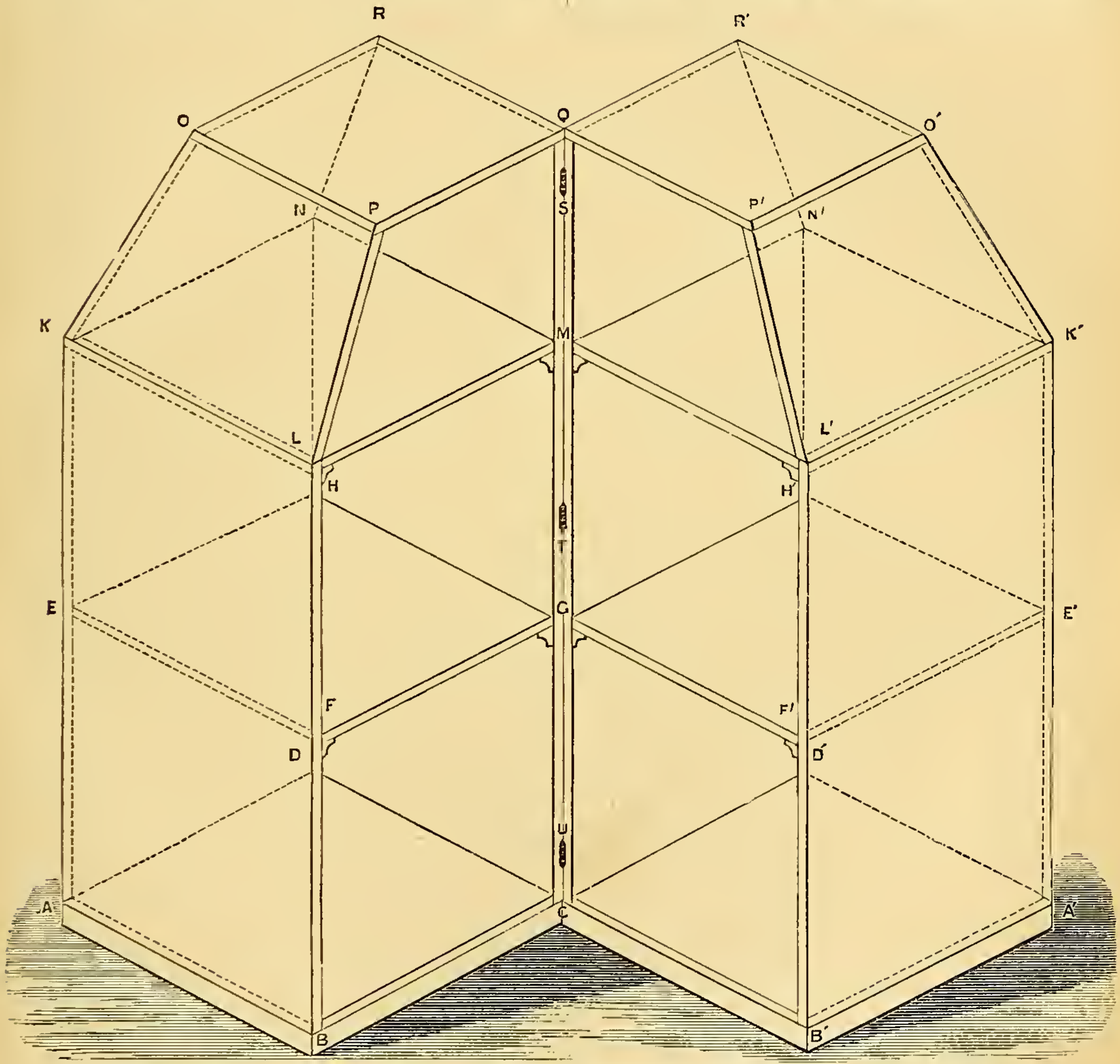


FIG. 2.—CARCASE OF DOLL'S HOUSE IN ISOMETRICAL PERSPECTIVE, SHOWING CHAMBERS IN INTERIOR.

circle, in the direction of the arrow, to A′, F to F′, C to C′, and D to D′, the points B and E describing semicircles, which it is unnecessary, on account of the space that would be taken up, to show in the diagram. By this movement, the backs G A, G F, of the two boxes are brought together in the position indicated by the dotted double lines, G A′, G F′, the sides, A B, E F, assume the positions A′ B′, E′ F′, and the fronts, B C, D E, now become the sides of the structure when fully opened, as shown by the dotted lines B′ C′, D′ E′. And the result of the movement is, that the interior is fully exposed to view in *two* compartments instead of one, as when the boxes were closed, *without any removal of the front;* and more than this, precisely the same space or area is occupied by the boxes when open as when closed, although this is a feature which this new form of doll's house possesses in common with the old form. A slight movement is all that is required to close the house, and when its owner is tired of playing with it, she, or her nursemaid, can shut it up without trouble.

It will be noticed that the accompanying illustrations are not done to scale, although they are drawn in certain fixed proportions. As long as proportional treatment is observed—that is to say, the adoption of

a certain proportion between its relative parts—a drawing to scale is not absolutely necessary. Indeed, the keynote to the relative proportions of the structure being given, it is as well to leave the settlement of the scale, etc., to individual requirements, for it is clear that a doll's house that would suit a large roomy nursery would be too large for a nursery of limited capacity, and to tie all intending builders of doll's houses to a bed of Procrustes, as regards size, would be unwise and impolitic. In all cases, however, whether the house consists of one, two, or more rooms, it is desirable to make the rooms or compartments of such a size that little hands may move its occupants and the furniture in and out at pleasure, with ease and freedom.

Again, considerable differences of opinion may exist as to the shape, size and height of the compartments ; but whatever may be the determination of the amateur builder, the principles of construction will be the same, or very nearly so, in every case—the house being built in two parts that are hinged together to admit of easy opening and closing, and rectangular in form. A departure, however, may be taken from the hard and fast rectangular construction, but I will purposely leave what I have to say on this point till the very last.

As a cube is what is termed a perfect figure, being of equal length, and depth, and height, and having its six sides equal, I have selected a cube as being as good a form as any that may be chosen for the shape of the rooms. The form of the house, or rather its ground plan, where the rooms are cubic in form, is that of a rectangle whose length is twice its breadth, a proportion which is good in itself for the object in view. Those who prefer a shallower and larger form of room, may make the proportion between the length and breadth of the rooms to be 4 : 3, or 3 : 2, or even 4 : 2, which would make the dimensions of the house, when closed, to be in the first case, 4 : 6 ; in the second, 3 : 4 ; and in the third, 4 : 4, or a complete square ; which would have a very ugly appearance. The proportions of my house when closed, as regards length and breadth, are as 2 : 1. The rooms are each taken to form a perfect cube *outside measurement*, that is to say, including the thickness of the sides, and it is on these lines that the isometrical projection of the body of the house, as shown in Fig. 2, is constructed.

From what has been said, it is obvious that any amateur who is unwilling to go to the expense or trouble of making a house out of sawn boards, may utilize a couple of starch boxes, or a couple of boxes in which tins of lobster or salmon have been brought to this country, to serve as the principal parts of the carcase, but as many will doubtless prefer to make the structure of new boards to suit their own views with regard to size, I will describe the house as if it were to be made in this way, and on the model that I have indicated. Firstly, then—I am now referring to Fig. 2—two clean rectangular pieces of board of nearly equal length and breadth should be chosen for the top and bottom of each compartment—namely, A B C D and K L M N for the bottom and top of the main compartment to the left, and A′ B′ C D′ and K′ L′ M N′ for the bottom and top respectively of the main compartment to the right. To make this clear, supposing we wish the rooms to assume the form of a cube outside measurement, and that we are using half inch boards for the sides of the cases, our top and bottom boards must be 11½ in. long by 11 in. broad, because the fourth side is open. These dimensions would be too small for any actual house, but they are merely taken by way of illustration, and also on the supposition that the amateur being not too skilful in joinery, will prefer to nail sides to ends, instead of dovetailing his work together. If he be a skilled hand, and resolves on dovetailing sides to ends, the top and bottom pieces must be perfectly square. The sides of the cases are represented in Fig. 2, in the compartment to the left by the rectangles A B L K, K A D N, and N M C D, and in the compartment to the right by the rectangles A′ B′ L′ K′, K′A′D′N′, and N′D′C M. Supposing that the sides and top and bottom in each compartment are put together, we have two rectangular boxes, each of which is exactly twice as high as it is long or deep. These compartments should be divided in each case into two divisions by a horizontal board E D G H in the left hand compartment, and E′ D′ G H′ in the right hand compartment. These boards need not be fixed, and may rest on slips, the ends of which are shown at D, G, and D′, which should be attached to the sides of the cases by small French nails or slight screws, and glued as well. These slips not only act as supports for the board which forms the ceiling of the room at the bottom, and the floor of the room above it, but they form the cornice of the room below, and should be cut from moulding suitable for this purpose ; and slips may be glued along the edges formed by the junction of sides and top in the lines L K, K N, N M, and M N′, N′ K′, K′ L′, as cornices to the upper rooms in the two compartments. The boards D E H G, G H′ E′ D′ should be fitted in easily, so that they may be withdrawn at pleasure without any difficulty. The carpets of the first floor rooms may be glued down to these boards, unless the more fashionable and far cleaner style of squares of carpet in the centre of the room, with stained and varnished spaces between carpet and walls, be adopted.

By following the plan that has been described, provision will have been made for a four-roomed

house, and if this be considered sufficient, the work may be finished by screwing on slips of wood flush *with the surface* along the lines K L, N M and M L′, N′ K′, and putting on a low-pitched gable roof between hese slips, first blocking up the ends above the lines K N, L M and M N′, K′ L′ which will afford supports for the roof-boards to rest on, and to which they may be nailed down. The roof-boards may overhang the house along the front of the entire structure and at the sides, but at the back the boards must be flush with the back, as any extension beyond the outer surface of the boards that form the back, would prevent the opening of the house when it is desired to expose the interior to view.

There is, however, a far better way of finishing the house at the top, which will not only give it what may be termed a more house-like appearance, but will also yield increased accommodation, making it, in fact, into a six-roomed house. To do this, it will be necessary to carry the boards which form the two parts of the back, namely, N D C M and N′ D′ C M somewhat above the level of the upper surfaces of the cases, shown by the planes K L M N, K′ L′ M N′, say to the extent of three-fourths the height fixed on for the lower rooms, outside measurement. Along the outer sides these boards must be cut on the bevel.

To do this in good proportion, take Q R = Q M, and Q R′ = Q M, draw the lines R N and R′ N′, and cut off the boards along these lines. The parts R N M Q, R′ N′ M Q, which are continuations of the boards that form the back, as it has been shown, form the backs of two attics, in the shape of a mansarde roof, the rooms being completed by two boards, namely, O R N K and O K L P, in the compartment to the left, and O′ R′ N′ K′, and O′ K′ L′ P′ in the compartment to the right, which must be cut accurately to the proper bevel. Unless the parts are dovetailed together, which may be difficult for some amateurs to manage as they are on the bevel, it will be found better to nail the back to the side R N, and the front to the side O K of the piece O K N R, and so on for the other compartment on the right. Of course, a neater job can be made by fitting all the parts together, both above and below, with mitred dovetail joints ; but there is no absolute need to do this, as the joints, whether roughly or neatly made, will be covered over with ornamental casing, and thus hidden from view.

In order to complete the carcase, nothing remains to be done but to nail square pieces of board, with the edges on two sides properly bevelled, as shown at O P Q R, O′ P′ Q R′, to form a flat roof for the building, and to screw slips, about $1\frac{1}{4}$ inches square, to the under-surface of the bottom boards, A B C D, A′ B′ C D′, for a purpose which I will explain in my next paper.

(*To be continued.*)

PRINTING FOR AMATEURS.

By A PRACTICAL PRINTER.

III.—REGULAR MATERIAL.

NEXT in importance to type in fitting up the composing room of a printing office, is the "material," under which designation comes all wood and metal receptacles used to stow away the various articles, as well as sundry tools used in the operations outlined in our first article on this subject, and now about to be more minutely described. In page 56, Fig. 1, an illustration is given of the general appearance of a compositor at work, or "at case," as it is technically termed. The artist who engraved the block has, however, placed the "composing stick" in the workman's hand in a way which would not facilitate the progress of his work; the correct way of holding this instrument will be shown further on, but I just draw attention to it before commencing my description of material used by printers, which we purpose to illustrate, in order that, together with the measurements and description given, amateurs may the more readily set about making any of the articles for themselves, with the least risk of error in design and details. I will take them in usual form of filling an order for a new printing office, in which, after type has been considered, next comes "cases" to put it in. Previously I have spoken of "cases" as "trays of boxes," but now we must learn to think and speak of these as "cases," no matter what size or number of boxes they contain. Cases may be defined as a set of boxes embraced in a frame, in which type is kept in use for composition. The most usual kind is commonly used in pairs, and when a pair of cases is spoken of, it is always understood to be an upper case and a lower case. It will be seen that the upper case has equal sized boxes, a thick bar running down the middle of the case, practically making it into two sets or series of equal sized boxes. In this case the capitals and small capitals of a fount are placed, the thick bar dividing the "caps" from the "small caps." The lower case is used for small letters, or "lower case," points, spaces, quadrats, etc. The boxes here vary in size, in order that more space may be provided for the letters most frequently used. The size of a "case," irrespective of the style of divisions, is usually 2 feet 9 inches long, 14 inches broad, front rail $1\frac{5}{8}$ inch deep, end and back rails $1\frac{1}{8}$ inch deep by $\frac{5}{8}$ths wide, bottom, $\frac{1}{4}$ inch thick, planted on. The partitions are $\frac{3}{16}$ inch thick by $1\frac{1}{8}$.

The terms upper and lower case are derived from the fact that the case containing the "caps," and consequently less frequently required letters, is always

on the upper part of the frame, with its lower edge resting against the back rail of the lower case, as shown in the illustration on page 56, two pairs of cases being there depicted, placed ready for work, so that two persons could work at the same frame if desired.

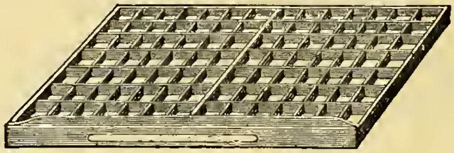


FIG. 4.—UPPER CASE.

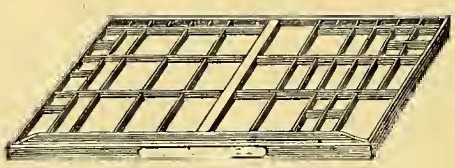


FIG. 5.—LOWER CASE.

A double case is the same measurement as any other case, but, as shown in Fig. 6, is divided into three equal parts by the two thick rails passing across it from back to front. Two of these parts are divided into unequal divisions for "lower case sorts"; the remaining third is occupied by the equal boxes of the "upper case sorts." This case is most useful to amateurs, as without it he would have to buy or make a complete pair of cases (Figs. 4 and 5) for every little fount of fancy letter that had upper and lower case sorts cast with it.

Those who must be economical first, neat and expeditious afterwards (if they can), sometimes resort to the expedient of "laying" the upper and lower in the same boxes, trusting to be able to distinguish one from the other by the size of the bodies; some even go so far as to "lay" two entirely different founts in the same case, keeping the sizes of bodies so far apart that they are distinguishable by their size. We need hardly say that such expedients should be the last resource, as it is clear time and money are saved in the end by proper provision for the keeping of the material.

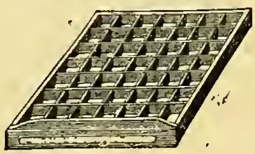


FIG. 8.—HALF CASE.

The triple or treble case (Fig. 7) has three series of equally divided compartments, and is designed to hold three distinct founts of job letter, much of which is cast and used without lower case.

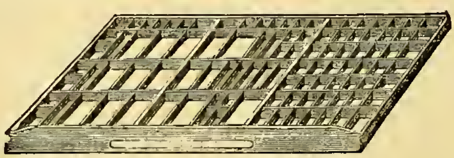


FIG. 6.—DOUBLE CASE.

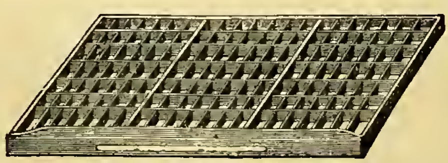


FIG. 7.—TRIPLE OR TREBLE CASE.

Half cases, Fig. 8, measure 16½ by 14 inches; other measurements same as those previously described. They are equally divided, and serve the same purpose as a triple case; but the reduced dimensions of length, enables the spare space at the end of a whole frame, Fig. 9, to be utilized by forming a rack for their reception.

The reader by this time knows that the rack with sloping top, used to hold cases, is called a frame. A frame to hold whole cases only is called a three-quarter frame, while Fig. 9 represents a whole frame; the difference being the space for half cases at the end, which may, or may not, be fitted with rails for the half cases, according to the price paid for it. The dimensions of a whole frame are—back, 4 feet 6 inches; front, 3 feet 6 inches; width, back to front, 21 inches; length, 4 feet 4 inches. A double frame is constructed to hold two full-sized cases, side by side, as Fig. 1.

Next in importance comes the composing stick, Fig. 10. This instrument consists of a light metal frame, with a sliding angle piece running up the back, square and true with the thick piece of metal forming the end. It is used to arrange the successive rows of type picked up out of the cases by the compositor, and when full is emptied in a manner which we shall describe. The sliding angle piece enables the width between the angle and the end piece to be constantly varied according to the work in hand. The depth of the stick is $\frac{5}{8}$ inch, and 2 inches wide from back to the open side. They vary in length from 6 inches to 12 inches. The material used is iron, steel, or gun metal. Longer sticks for posters are called broadside sticks; they are made of wood for the sake of lightness. Formerly the "stick" was commonly made in wood—hence its name. Newspaper columns are always one definite settled width, and the "sticks" used by the compositors are made without the sliding angle piece, to ensure all the matter being the same width.

When the stick is full, the type is lifted out and placed upon the galley, shown in Fig. 11. This is simply a shallow tray, with ledges $\frac{5}{8}$ inch deep running round one side and end, the other two being left open. They are made of wood, a better class being made with zinc bottoms and wood sides, while the best of all are formed of metal, true and square in every respect.

When the galley is full and the type is ready to make up into a page, a chase, Fig. 12, is required. The chase is simply a rectangular frame of cast or wrought iron, inside which the type is wedged up by

means of wooden wedges called quoins. Chases are of every size to suit the pages of type in use. When the type is locked up in the chase, as we shall describe, it is called a forme. Mallets and brushes are too well known to need description; but the brushes for printers' use are specially made to resist the strong alkalies used in cleaning the type.

The planer is a simple flat block of hard wood, and is used to "plane" or flatten down formes of type during the process of locking up. They may be of any convenient size, 8 inches by 4 inches by 2½ inches thick being usual for job work. The groove made round near the top side is for the purpose of affording hold for the fingers when using it.

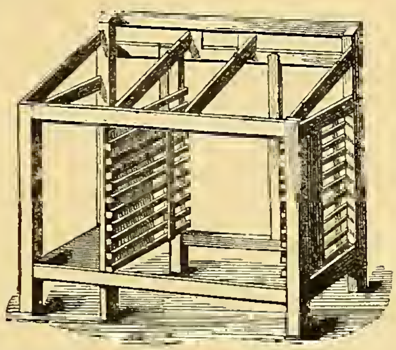


FIG. 9.—WHOLE FRAME.

Setting rules (Fig. 13) are thin pieces of brass with a projecting ear at one end, and are made of various lengths, to suit the width of the column of type being set up. Its use will be apparent when we are considering details of composing.

The bodkin, a useful little instrument shown in Fig. 14, needs little description other than the engraving, further than to state it is used for altering or correcting, by aiding to withdraw and replace types when in formes.

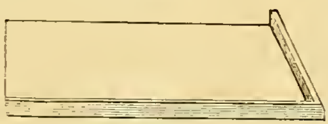


FIG. 11.—GALLEY.

FIG. 12.—CHASE.

FIG. 14.—BODKIN.

FIG. 15.—SIDE STICK.

FIG. 16.—QUOIN.

FIG. 13.—SETTING RULE.

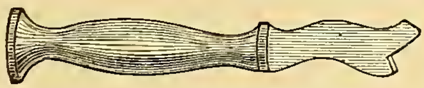


FIG. 17.—SHOOTING STICK.

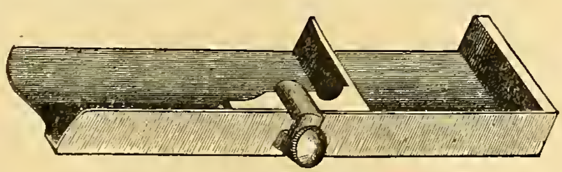


FIG. 10.—COMPOSING STICK.

Reglets are thin pieces of wood, $\frac{5}{8}$ inch high, and of various thickness, usually made to equal the body of some letter, such as Brevier reglet and Pica reglet, which last equals $\frac{1}{6}$ inch thick, so that six laid one on the other would measure one inch. Reglets may be tested for accuracy this way, using the table of ems to the foot given on page 187. Reglets are used to space out lines of type by placing them between the rows of letters.

Furniture consists of parallel strips of wood, $\frac{5}{8}$ths of an inch high, and regular definite widths, thus—narrow, 3 ems; broad, 4 ems; double-narrow, 6 ems; double-broad, 8 ems (remember the em is $\frac{1}{6}$ of an inch). They are cut up into lengths as required, and are used to place between lines of letters in large wall bills, and to surround formes locked up in the chase. The groove is to aid its bedding on the press true and square. Hard dry wood should be used in manufacturing furniture of all sorts and sizes.

Side and foot sticks are very much like narrow furniture, only they taper down from one end to the other, as shown in Fig. 15. They are also cut up in lengths as required, the usual form in which they are supplied being 36 inches long. Their use is to form abutments or wedges for the quoins shown in Fig. 16 to operate in compressing the type in the chase into a solid mass.

The shooting stick, Fig. 17, is used in conjunction with a mallet to force the quoins from the widest part to the narrow end of the groove made between the side of the chase and the side sticks.

Leads are thin strips of type metal, six of which measure a pica = 36 to an inch. They are also cast 8 to pica and 4 to pica. They are really made of type metal, not merely lead, and are used to place between lines of type which require to be closer together than the thinnest reglet.

Imposing stones, or imposing surfaces, are merely flat surfaces of stone, slate, or iron, upon which the type and chase are laid when locking up into a forme.

We have now described nearly all the "material" which is used in and about printing, save that belonging to rollers and presses, which we shall consider under the head of "Press work" in a future paper.

Those who desire to make for themselves have now a general idea of the style and dimensions of regular goods; and they may suit their own idiosyncrasies in varying these details. One word as to schemes for making cases to hold letters with different arrangement of boxes than those shown. They will be labour in vain, for the experience of

years has proved that those described are the best for the purpose in view. If case making is attempted, care must be taken to use well-seasoned wood. The frame work is dovetailed up, and the thick cross rails inserted. Grooves are made for the ends of the partitions forming the small boxes, which are dropped in from the under side, and the bottom is nailed on last. Great care must be used to see that the bottoms of the partitions touch the bottom of the case, otherwise, small types will slide from one box to another, and give constant trouble to the compositor, who will pick up all sorts of letters from one box, and render clean proofs an impossibility. Certainly, the best plan is to procure at least one case of regular manufacture, take it to pieces, and construct yours like it, with any constructive improvement that occurs to you. Composing sticks again, require great exactness, and unless the amateur is very skilful they are safest purchased of a good dealer. The furniture, reglet, etc., is all very simply made, but the edges must be square and true, or the result will be that, instead of making up a forme, you will certainly make "pie," a term which is full of expressive horror to the printer's mind ; and we trust that our readers are so carefully paving their way by the help of these pages, that such experiences may be few and far between. Nothing is so trying to the young printer as to surmount all the difficulties of setting up a page of small type, and then at the last moment of locking up the page in the chase to see the whole mass tumble to pieces, thus making " pie," a result which will surely be achieved if proper care is not exercised in the previous operations.

We have now a fair idea of the articles generally required in the printing office, and their uses ; so that our next paper will be occupied with the practical handling of this "material." Prices we have not given, as so many lists are published in which all this information is easily obtained ; the great difficulty is in understanding the exact article technically described and priced. Messrs. Squintani and Co., *London*, and The Birmingham Machinists' Company, *Birmingham*, both issue excellent price lists. We are indebted to the courtesy and kindness of the latter firm for the use of many of the wood engravings illustrating the modern material of the printer's workshop.

Thus far I have now brought the amateur on his way to become, I venture to hope, a printer of no mean skill. The materials and appliances are easy to deal with ; the labour, as far as the work an amateur will undertake, is by no means laborious ; and the results, if ordinary care be taken, are generally such as to encourage him to persevere in his self-imposed task. (*To be continued.*)

NOTES ON NOVELTIES.

AMONG the many dealers in the apparatus, materials, and chemicals required in the practice of photography, that are to be found in London and in the larger towns of the United Kingdom, a prominent place is occupied by Messrs. J. F. Shew and Co , *Photographic Stores*, 88, *Newman Street, Oxford Street, and* 132, *Wardour Street, Oxford Street, London, W.* If I may judge from their price-list, which is issued under the title of "The Photographer's Guide," I have, however, stronger evidence than this in their favour, having recently seen their " New Model " Dry Plate Camera, New Pocket Dry Plate Camera, Portable Folding Dry Plate Changing Box and the Eclipse Instantaneous Shutter, which for construction, beautiful finish, and marvellous suitability for the objects in view, are pieces of mechanism which may fairly claim to be among the very first of their kind. The "New Model" Dry Plate Camera is made in six different sizes to take plates, ranging in size from 6½ in. by 4¾ in. to 15 in. by 12 in., at prices from £4 17s. 6d. to £10 10s., and with these are supplied extra double backs at prices varying from 15s. to 40s., according to the size of the camera. They may be had furnished with brass-bindings for hot climates at additional cost, ranging from 15s. for the smallest size to 42s. for the largest. These Cameras, specially designed to meet the requirements of tourists and landscape photographers, are made of the finest mahogany and are provided with bellows-body of best leather, double swing back, hinged focussing frame, rack and pinion adjustment for focussing, one double back for dry plates with new improved folding shutters, two inner frames for smaller plates, side wing double action, front and extra front. In testimony of its lightness and therefore its portability, it is only necessary to say that the camera measuring 10 in. by 8 in. by 4½ in. with one slide, weighs only 4½ lbs., no great weight to carry. Its special features are its improved double swing arrangement and improved spring catch shutters and slides. This size of camera draws out to 11⅝ in. ; indeed, after seeing the instrument closed, it is perfectly marvellous to see it open out to its fullest extent, to mark the number and high finish of its fittings, and note how easily the front can be turned in any direction without altering the position of the camera itself. To any one who does not understand its mechanism, its changes are simply surprising, and causes no little wonder as to how it is contrived, and how its numerous parts are connected. The little New Pocket Dry Plate Camera is quite as remarkable for its construction and finish ; it is made of mahogany, French polished, has a bellows-body of leather, and one double dry plate slide. It is made in two sizes to take plates 4¼ in. by 3¼ in. and 5 in. by 4 in., and is sold at £1 1s. for the smaller size, and £1 7s. 6d. for the larger size. Extra double slides can be had for these cameras at 4s. 6d. and 5s. 6d. each, according to the size the instruments, and they can be fitted with brass pinion and rack at 6s. 6d. and 7s. 6d., also according to size. More highly finished specimens of these cameras are supplied at a comparatively small advance in price, both for the camera itself and for its extra fittings.

The Portable Folding Dry Plate Changing Box, whose purpose is indicated by its name, occupies but a very small compass, and can be opened and closed with great rapidity, assuming the appearance of a portfolio when closed. They are strong and durable, and will bear a great amount of even rough usage. They are made for changing plates varying in size from $6\frac{1}{2}$ in. by $4\frac{3}{4}$ in. to 12 in. by 10 in. Their size, when closed, ranges from 13 in. by 10 in. by 1 in., to 24 in. by 16 in. by 1 in.; the extent of expansion being from 9 in. in the smallest size to 15 in. in the largest; the weight ranges from $2\frac{1}{2}$ lbs. to $6\frac{1}{2}$ lbs., and the price from 15s. 6d. to 42s. They are beautifully made, and must be invaluable to the tourist. I do not see why they should not be made available for work at home, especially when space is limited. But perhaps the most remarkable of Messrs. J. F. Shew and Co.'s Specialties is their Eclipse Instantaneous Shutter, which opens concentrically, and, therefore, gives the greatest possible amount of light during exposure. The motion of the valves of the shutter can be regulated so as to be faster or slower, according to circumstances, and it is wonderful to see how even and regular the action is under any rate of motion, fast or slow. It is made in three sizes, for $1\frac{1}{4}$ lens and under, $1\frac{5}{8}$ lens, and $2\frac{1}{4}$ lens, supplied respectively at 21s., 26s., and 31s. 6d. The first two sizes are fitted with an extra adjustment for lengthening exposure for an extra charge of 3s. 6d., and the third and largest size for 5s. Amateur photographers about to provide themselves with an outfit should not fail to inspect these specialties with a view to purchase.

Messrs. Kent and Co., Agents and Importers of French Wire Nails and Fancy Gilt Nails, etc., 20, *Old Compton Street, Soho, London, W.*, have sent me some specimens of the nails that they supply. The wire nails are excellent in quality, and so are the furniture nails, which are beautifully made, and far superior to the brass-headed nails of this class that are generally used. Messrs. Kent and Co., however, have omitted to send me their price-list with the specimens of their nails, so I am unable to tell my readers at what rate per pound or per thousand they supply them; and in these days of competition the price has a great deal to do with the sale, *cæteris paribus*. If Messrs. Kent and Co. will let me have the prices of all kinds of nails sold by them, I will duly insert them. The omission now is not my fault.

I have received from the author, M. Edward Rischgitz, his "Handbook on Tapestry Painting in Indelible Colours," a pamphlet $5\frac{3}{4}$ in. by $4\frac{1}{2}$ in., 46 pp. The writer is also author of another *vade mecum* for amateur painters, namely, "The Handbook for China Painting on Glass." The manual before me is a translation from the original French, by A. Rischgitz, and is published by the author at *Cambridge Lodge Studios*, 43, *Linden Gardens, Bayswater*; its price is 1s. Painting on Tapestry is a decorative art which cannot fail to become popular as it is more quickly done, far less costly, and quite as durable as tapestry produced in the loom or by the needle. In its scope, both as regards subjects and material, it is wide and comprehensive, as any subject may be produced, whether landscape, figures, flowers, or fruit on various textile fabrics, such as cotton, silk, linen, and cloth, in, and by means of colours that are indelible. M. Rischgitz's pamphlet goes fully into every particular of this new art, from the choice of material on which to paint, to the treatment and finish of all kinds of subjects: this is followed by a useful table of the colours used and their various combinations; and the book is rendered complete by the notification of the author's charges for instruction in the art, and also in painting in oil and water colours, and on china, in drawing from the model and in charcoal, and in etching on copper, in his studios at the address given above. A price-list of indelible tapestry colours and mediums is also appended.

Mr. A. S. Lunt, Saw and Tool Maker, 207, *Hackney Road, London, E.*, has sent me a price-list of his Improved Patent Cramps for joiners and all departments of the wood-working trade, which are remarkable for their strength, lightness, simplicity, and durability. The advantages claimed for these cramps are—1. The self-fastening sliding jaw, which only requires pushing up to the work, and which cannot cant or work loose on the bar, for the greater the pressure that is applied, the firmer is the grip. 2. The steel bar of the cramp is made without holes, which causes it to be double as strong as the perforated iron bar of the ordinary cramp. 3. The capability of instant adjustment on any part of the bar, which saves time, and obviates the necessity for a long screw, which is liable to be strained under heavy pressure. The bench cramps are made in various patterns, distinguished by letters. Each pattern varies in length from 3 ft. to 7 ft., being made in eight different sizes, taking in lengths of work varying from 2 ft. to 6 ft., according to size of cramp. There is a slight difference of price in the patterns, the T pattern ranging from 17s. to 28s., and the A and B patterns from 16s. 6d. to 26s. Ekes, or lengthening bars, measuring 2 ft. and upwards, can be had at 3s. per foot for the T patterns, and 2s. 6d. per foot for the A and B patterns, and shoes for bench use, which can be put on and taken off again when not required, at 1s. 6d. per pair. The cramps consist of a steel bar serrated along the top edge, having at one end a jaw attached to, and worked backward and forward by, a short deep-threaded screw, and at the other a sliding jaw, which is held in place by a short piece of iron, which is notched to correspond with the notching of the bar, and which, when dropped into place, prevents the back motion of the jaw. The steel bar of the T pattern is $2\frac{1}{2}$ in. by $\frac{5}{8}$ in. in section; that of the A pattern, 2 in. by $\frac{1}{2}$ in.; and that of the B pattern, $1\frac{3}{4}$ in. by $\frac{3}{8}$ in. Patent sash cramps on the same principle are supplied by Mr. Lunt. Of these, Nos. 14 and 16 will be found useful by amateurs. The steel bar of No. 14 is $1\frac{1}{4}$ in. by $\frac{1}{4}$ in. in section, the length ranges from 24 in. to 42 in., and the price for black bars varies from 7s. to 12s., an additional charge of 2s. being made in each size for bright bars. No. 16 is of the T pattern, and is $1\frac{3}{4}$ in. by $\frac{1}{2}$ in. in section, and from 30 in. to 60 in. in length. This pattern is supplied only in black bars, and the price ranges from 11s. to 18s., according to size. One great merit of these improved cramps and sash bars is that they can be used in any position, there being no pin to drop out, and no projecting parts to prevent them from lying flat. I am compelled to hold over two or three notices till next month, owing to want of space.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

TO MY READERS.

In order to clear up arrears of correspondence, and to give, as far as it is possible to do so, a reply to letters received during the month of April, up to the 15th, it has been found necessary to substitute eight additional pages of "Amateurs in Council" for the large folding sheet that is generally issued with each Part as a Supplement. Five pages in the body of the Magazine have also been devoted to correspondence, so that the present Part contains no less than THIRTEEN PAGES of replies to queries and requests for special information on various subjects of interest to amateurs, a thing unprecedented, not only as regards AMATEUR WORK itself, but also with reference to any other serial publication of a practical or semi-practical character that exists, or has existed, either in the United Kingdom or the United States. It was hoped that the addition of two pages to each Part of the Magazine would gradually do away with the necessity of delay in dealing with queries proposed by readers, but as of late the correspondence has greatly increased, it has been judged better to bring things to a proper level by a single effort, which has accordingly been attempted, but not successfully carried out, as there are nearly four pages of replies, etc., in type, which cannot be included in this Part, and must perforce stand over for the next.

Now experience has shown that with regard to any Magazine in which answers are given to correspondents in quest of information of any kind, *the amount of correspondence is a sure and certain test of the vitality and healthy condition of the publication, and the estimation in which it is held by that section of the general public to which it specially appeals.* I will leave my readers to apply what I have said to AMATEUR WORK and other Magazines that are, or seek to be, similar to it in character, contenting myself by saying that the entire mass of the correspondence that has appeared in this Magazine from first to last is GENUINE, and that not a single reply has ever been coined, as is sometimes done, either to fill up a spare column or so which cannot well be filled by any other matter, or to throw a fictitious glow of prosperity over the serial which it by no means possesses.

For the future every endeavour will be made to answer all queries received between the 15th of one month and the 15th of the month next following in the Part that is dated for the month next in order. For example, it will be sought to answer all queries received between April 15th and May 15th in the Part for June. The reason for this is that it is necessary to go to press with the magazine as soon after the 15th of each month as possible, in order to get it ready for publication about a week in advance of the date it bears. Therefore, as many replies involve illustration, which of itself takes time, I venture to hope that my readers will see that it is desirable that they should send in their queries as soon as possible after the issue of each Part, in order that reasonable time may be given to obtain the information that is asked for; and that those who kindly take upon themselves to supply information of special character to those who seek it, which cannot be immediately answered in the usual way, will adopt and follow the same course.

Lastly, with reference to our Supplements: as many have complained of the inconvenience of the large folding sheets hitherto given in all except one solitary instance, for the future, when the design under consideration permits, these will be restricted to the size of two pages of the magazine, thus forming folding leaves, which can be more readily bound up with it. Large Supplements, however, must occasionally form the exception to this rule, from the fact that the subjects illustrated in them cannot be conveniently compressed into less space.

Mechanical Toys.

EGROEG.—A series of articles will appear shortly, which will give you the desired information.

Harmonium Reeds for Sale.

L. G. L. has for sale 19 dozen harmonium reeds which may be made up into sets by a few extra reeds, 2s. 6d. dozen, or £2 the lot. Will also supply the remaining reeds required at 3s. 3d. per dozen. [L. G. L. does not give his address, without this it is impossible to communicate with him. Kindly rectify omission.—ED.]

Harmonium-building.

RIC. E., E. R., JUMBO, VIBRATOR, and others. The queries put by these writers cannot be satisfactorily answered, except in articles on making a harmonium larger than that which I have described in my papers.

P. B. and O. R.—1. If you cannot get beech, use ash or cherry. I have found both answer. 2. The board directed to be screwed down on top of wind-chest should *remain*, and not be removed, as stated, and the sound-board should turn down on and hook down to this board with iron hooks firmly. This board also carries the stops Expression, Tremolo, Sordine, Forte, etc. A description of these cannot be sent in a letter contained in the compass of a brief reply to a query.

E. T. J.—Your vibrators are not screwed down firm if they do not speak quick to touch; they will come better with playing. 2. You can tune them by filing top side of vibrating end to make sharp, or scraping near rivets to make flat.

T. E. M. (*Hackney*).—The size of the *prepared* sound-board is 2 ft. 7 in. by 6 in. Keyboard making is quite a separate trade to harmonium building, and a very delicate operation for an amateur to perform. Old pianoforte keys do well. I have never seen or heard of a book on harmonium-building.

VIBRATOR, and others.—I am glad to learn of your success. I wish I could give you the information you ask for, but it cannot be efficiently done in an ordinary answer to correspondents, because some very elaborate drawings would be required.

Velocipedes.

BICYCLIST.—To buy the materials for the tricycle in question, which consists of hubs, spikes, rims, rubbers, crank, chain and wheels, framework, castings for bearings, and the necessary smith-work, would cost a little over £4. As to bicycle; does BICYCLIST mean the cost of materials to make up, or does he mean the price of the "Club" and "Rudge" machines? If the latter, the makers' prices are from £16 to £18. If for materials, I don't think he would get them from the above makers; but he can get the parts of a good ordinary bicycle, viz., front forks and bearings, backbone and back-fork, handle bar and handles, and spring, complete, fitted up ready for wheels, for 30s. Wheels, front and back, with rubber complete, from 8d. to 1s. per inch diameter; pedals, cranks, and saddle, 10s. I got my materials from J. Deney and Son, *Wolverhampton*. It is the cheapest house I know, and the things were good. In this way the cost would be a little under £4 10s. You can buy a good useful bicycle complete from this firm, for £4 10s.

ACHILLES.—Of course you cannot remove rust from bicycle-spokes without some labour; but there is not much difficulty in it. Rub the spokes first of all with a cloth saturated in paraffin, let this stand for an hour or two, then wipe off; now get another cloth, saturate with ordinary sweet oil, and sprinkle plentifully with fine emery, rub the spokes from end to end with this. If the rust is very deep, use coarser emery at the beginning. When all are rubbed, wipe off with another cloth, then saturate a piece of clean cloth in paraffin, and rub them once more. This will prevent their rusting again in a great measure. It is better to paint them, after which, they only need washing.

Righting a Buckled Bicycle Wheel.

JACK HOANER writes:—In Hints to Bicyclists in Trouble the writer said it took four persons to right a buckled wheel; this number has since been reduced to two by another correspondent. Pardon me if I still further simplify the operation by stating that I have twice fallen on my front wheel and buckled it, gathered myself up, placed a knee on each of the high parts, a hand on each of the low parts, and by a slight pull put the wheel correct again. This can easily be done by a single person, which knowledge may save some unlucky rider carrying his machine home.

Inlaying in the Solid.

J. B. (*Long Melford*).—The incised work in the solid wood must be done with carving tools suitable for the purpose, and the space thus made, filled in with wood, brass, etc., accurately cut to fit. You will find it easier to cut out your design with the fret-saw in two pieces of wood of different colours by one operation, and then to veneer the solid with one colour, using the other as inlay.

Preparation of Wood for Artists' Black.

H. A. D. (*Cork*).—Rub down the surface with fine glass-paper, and stop all holes and defects with any preparation made for the purpose, before applying the black.

Organ-Building.

G. J. M. (*Clapham*).—The scale for wood pipes is made exactly the same as that for the metal, with the addition of the second sloping line for the other diameter. The 6 inches is set off from the bottom. The size of 1½ inch C of the flageolet will be about what you state. The table for paper pipes applies to the wood pipes also, so there is no need to set one out separately. The mouth of the Lieblich Gedact may be cut up any height from less than ⅓ to ½, according to the power you require. Your specification is an excellent one. If you can stand to the expense, an oboe in the swell would be an acquisition. Size: About 6 feet 6 inches wide, 3 feet 9 inches deep, and 9 feet 6 inches high; but it depends on how you arrange your pedal pipes.

F. E. K. (*Pimlico*).—You can remedy your error by allowing the pipes to increase in scale much more gradually, so that the largest pipes only exceed the correct scale by about ⅝ inch at the most; otherwise they will be too loud for a chamber organ, if voiced to bring out the tone properly.

J. B. (*Tyne Dock*).—The difference between the cost of pine and mahogany for the sliders would only be about a couple of shillings, and I should be afraid to trust to the former, as so many holes have to be bored through. You could enlarge the scale of your pipes by cutting them two notes sharper, and making two extra ones for the lowest notes. As regards the large stopt pipes, you can make them louder by cutting the mouths higher and enlarging the hole at the foot. Experiment on one first until you satisfy yourself. If you don't succeed you could enlarge the scale as proposed, but I find those I made to scale given answer well. See top of column 2, page 26, as to scale for bass.

G. E. B.—The small organ indicated in Fig. 5, Part 15, seems to be a favourite type with our amateurs. Some of the tenor channels could be transferred to the treble end in the same way as described for the larger soundboard. I would suggest that the "oboe" stop in your specification should be carried to tenor C. Slider the same width as stopt diapason. The holes for the dulciana and oboe should be about the same as those for the flute. It is better to make them too small than too large, as you have not purchased your pipes. They can easily be enlarged if necessary.

C. S. (*Clonmel*).—The American organ differs altogether from the harmonium in construction. The bellows exhaust or suck the wind instead of driving it through the reeds. The reeds are bent in a peculiar manner, and are much thicker than harmonium reeds. In my opinion the American Organ is much to be preferred to an ordinary harmonium.

Pulsator Organorum.—1. The inverted fold is best at the top, but if you have completed the bellows you need not alter it. 2. The Violoncello would be the best bass for the two stops you mention. 3. As regards the "chiffing," see answer to J. B. on page 294, Vol. II. Try passing a flat-bladed knife gently down the windway, as that will often effect a cure.

J. W. (*Hartlepool*).—You could get paper for the pipes from any stationer in London. You merely require common cartridge paper, which will cost about 1s. 6d. or 2s. a quire. Hammond, of *Walworth Road*, or Dean, of *Wandsworth Road*, would, no doubt, be glad to supply you with any quantity. About 50 yards of brown paper, and about 5 quires of cartridge, would be sufficient for the four stops you mention.

J. J. (*Lochie*).—I presume you intend making the small organ described in Vol. I., only having all paper pipes instead of wood and metal. If you have not yet made your soundboard, by all means let me advise you to follow the instructions given in Part 15, and make it also with the twelve bass channels at the back. If you adopt the style of action shown in page 273 Part 17, Fig. 60, you may get your organ in a height of little more than 6 feet. Fig. 61, on the same page, and the written instructions accompanying it, will explain how the action is brought under the proper channels, notwithstanding the fact of the soundboard being longer than the keyboard. In the event of using the action below the keyboard, however, Fig. 61 must be looked at from the top, that is, the narrow part of the fan will be at the front instead of the back. White sheepskin *must* be used.

H. T. (*Clapton*).—1. The dark coloured paper which you enclose will be the best for large pipes. 2. The tuning-caps should increase in length with the size of the pipes, but the exact length is immaterial. 3. Two coats of varnish inside the pipes will be better than one coat of size and one coat of varnish. 4. If you have 2½ octaves of pedals they will range from C C C to F, but remember they take a lot of room, and the organ is not very large. Wait for the chapter on pedals before you decide as to this. 5. A sliding pedal-board will not materially increase the height of the organ. A pedal-board to take out would not increase the height at all.

G. F. D. (*Youghal*).—Thomas Willis, of the *Minories, London*, will supply you with all you require. Write to him for a price list.

D. H. F. R.—The stops you mention will be very well balanced, but would be better if you break them at Tenor C instead of middle C. Two other stops could be added, and might all be blown by foot power.

T. J. (*Ferndale*).—Designs for organ fronts will be given, from which you will no doubt be able to get what you require. You do not say how many or what stops you have on your small organ. The size of wind-trunk mentioned would be sufficient for three through stops.

A. L. (*Stoke Newington*).—1. The leather should have two or three coats of glue as it soaks in so much. 2. Half-strained sheepskin is specially prepared for organ builders, and is different to unstrained. 3. There is nothing behind the wind-chest except the cartridge paper glued on the channels. The thin lines (Fig. 2 on the sheet of details) show the end cheeks, which extend right across so as to rest on the building frame. Fig. 49, on page 223, should be the same scale as Fig. 48, and the top piece in Fig. 40 should be the same width as the lower one instead of 3¼ inches as printed.

H. A. P. (*Glasgow*).—The spacing of the channels of the sound-board for the small organ shown in Fig. 5, Part 15, will depend entirely on the length you make it. The only rule is to allow the channels to run larger as the pipes increase in size. The largest channel in the Tenor may be ¾ or ⅞ inch, and the smallest treble ¼ inch. The channel bars are all about the same thickness as the channels which they adjoin. The bass pipes are the largest ones, and are made in the same way as the others of the same stop; they are described in the articles. The stops mentioned will make a nice little organ, but it would be better to carry the flute right through. The keyboard described in Part 10 will suit you.

C. J. C. (*Haverstock Hill*).—The leather for the bellows should be pared down at the edges on the soft side, not on the rough side as stated in your letter. It means simply this, that instead of allowing the thickness of the leather to stick up and so be liable to be pulled off by anything that happened to knock against it, you pare the edges away to nothing on the side that you glue, and it then lays close down to the wood when fastened on; there is no edge for anything to catch against, it looks better and holds better. The little bellows you have noticed on the wind trunks of large organs are termed concussion bellows, and prevent the sudden rush of wind being felt in the pipes when suddenly changing from loud to soft, or *vice versa*. The tremulant will be described in due course.

Leather for Organ-Building.

Amicus wishes to inform amateur organ-builders, that they may get leather specially prepared for piano, harmonium, and organ work, at 24, *Duke Street, Bloomsbury, W.C.* [Thank you for your good opinion of Amateur Work.—Ed.]

Paper Organ Pipes.

John Halford (*Clifton, near Rugby*) writes:—I have only just seen this month's Amateur Work, and observe the notice as to "Paper Organ Pipes," and so write to inform you my address is as given above.

Relievo Maps.

W. Collett.—*Leith Hill and Hind Head.*—Your first remark regarding the geology of the hills in question is correct. The error was, in the first place, a clerical one, which was not discovered until too late to be rectified. Your second objection does not hold good, the hills being outliers of the great range of the North Downs. If you examine any good map of the district (for example, Stanford's Physical Map of England and Wales, price 6d., or the Ordnance Survey), beginning at Dover and tracing the heights, sometimes chalk, sometimes greensand, etc., to Farnham, you will admit this. To the modeller we would say: Follow the chalk outlines through the whole of the length of the range, for, although denuded of the chalk which formerly overlaid them, they still retain the soft undulations or rounded shapes of their original structure. It should be understood that the table on page 109, Amateur Work, is intended only as a general guide for contours, heights and locations.

Renovating Old Prints, Etc.

A. B. R.—A series of papers on "The Renovation of Old Prints, Drawings, and Oil Paintings, with the colouring, mounting, and varnishing of maps and plans," by John Brion, is nearly completed, and will appear in due course. The best varnish for oil paintings is mastic. Take care to buy of a well-known firm, as Winsor & Newton, or Reevce & Son, *London*, as the invaluable mastic is ofttimes scrionslyadulterated with inferior gums, which cause opacity, cracking, etc. If our correspondent can wait the appearance of our papers on the subject, we think it will be to his advantage, as the best methods of preparing an oil painting for varnishing, as well as the *modus operandi* of the varnishing itself, will be given.

Polishing Floors.

F. W. (*Lower Tooting*).—The ordinary and in some respects the best polish for stained floors, is composed of beeswax 1½ pounds, turpentine 1 pint, resin 5 ounces, melted together. Full directions for varnishing and polishing such floors are given at page 106, Vol. I. of this work.

Imitation of Walnut.

W. L. (*Golborne*).—A description of the method of imitating walnut-wood in graining will be given in the series of papers entitled "House Painting and Papering." If you have never tried your hand at graining, I am afraid you will not manage to paint your chest of drawers in this style to your satisfaction. I therefore recommend you to stain the wood work with Stephens' Walnut Stain, and then varnish or French polish.

Painting and Graining.

CAMBERWELL.—Actual specimens of wood and marble will afford the best patterns for imitation. There is a book, by Ellis A. Davidson, published by Messrs. Crosby Lockwood and Co., *Stationers' Hall Court, Ludgate Hill, E.C.*, entitled "House Painting and Graining," 6s., which may be of use to you.

Gelatine Moulds for Plaster.

C. T. (*Bristol*).—Best sheet gelatine 1 pound, beeswax ½ ounce, water ¾ pint, boil together to a thick syrap and pour them over the plaster model whilst still moderately warm. The model should first be slightly greased with hog's lard. C. T. is referred to page 388, Vol. I. AMATEUR WORK, for further information.

Brazing Model Boiler.

H. W. (*Cupar Fife*).—See that all parts intended for joints fit well together, and are bright and clean. Bind them in their position with iron wire, or clamp them with iron screw clamps. Make a paste with powdered borax and water, mix a quantity of soft brass filings (brass spelter) with the borax paste, and thickly anoint all intended joints with the mixture. Gently heat up the article in a clear fire of charcoal, or coke, or by means of a blowpipe on a composition support of powdered charcoal and fire clay (see p. 278). Increase the heat until the article is red hot, and the spelter runs into the joints, then allow the article to cool down. More specific instructions for this and similar jobs will be forthcoming in future articles.

Plumber's Joints.

R. W. (*South Hackney*).—The metal is an alloy of one part tin to two parts of lead—equal parts of both metals are used by some. The ends of the pipes are scraped bright and clean, then the limit of the joint is marked by a ring of lampblack and size. A greased pad of moleskin is held in the left hand so as to cover the hand, the melted metal is poured from a handy iron ladle (held in the right hand) on the joint, and the soft metal is wiped into the egg shape with the pad of moleskin. This is only a general direction for the job; more specific directions will be given in articles bearing on the subject; but it must be noted that experience is the only teacher that can teach you to make a good plumber's joint.

Oak Mouldings for Cabinet Work.

H. P. (*Highbury*).—Atkinson's mouldings are in pine. You will not be able to purchase mouldings in oak, anywhere—at least, I have never seen or heard of ready-made mouldings in this material for cabinet-work, and you will be obliged to get a cabinet-maker to prepare them for you if you cannot make them yourself.

Jersey Readers. Attention!

THOMAS S. SYER, (1, *Finsbury Street, Chiswell Street, E.C.*,) sole London agent for the Patent "Standard" Instantaneous Grip Bench Vice, writes:—"I received a letter from Jersey for one of my catalogues, but the name of the applicant was omitted. I think it very likely that he is one of your readers. If so, and he will send me his name and address, I shall be glad to forward my catalogue to him. I have been waiting, expecting he would write again. Can you put this in a spare corner of your magazine? [With pleasure, Mr. Syer.—ED.]

Block Planes.

INQUIRER.—In reply to this and other correspondents who have asked what a "block plane" is, I may say that the peculiarity of planes thus called consists in the cutter being placed at a very acute angle for cutting across the grain of wood. Block planes are of American origin and make, and can be had from Messrs. Charles Churchill & Co., 21, *Cross Street, Finsbury, E.C.* The best in the market are Bailey's Excelsior Block Planes, which are adjustable by a screw and lever movement. A good plane of Bailey's make for general use is 6 inches in length with 1¾ inch cutter, the price being 6s. 6d., or with rosewood handle 7s. 6d. The Stanley Iron Block Planes are cheaper. A small one 3½ inches long with 1 inch cutter, can be had for 1s.; 5½ inches long with 1¼ inch cutter, 2s.; in the same size, adjustable, for 3s.; 7½ inches long with 1¾ inch cutter, 3s., or same size, adjustable, 4s. This kind of plane was first introduced as a convenient tool for fret-sawyers, picture-frame makers, etc., but it has proved so valuable to mechanics in all the lighter kinds of wood working, that it has come into general use in the United States.

Lines on "Amateur Work."

D. W. (*Clydach*) is thanked for his poetical tribute to the value of AMATEUR WORK, but poetry is not admissible.

Loosening Tightened Screw.

TALIESIN JONES.—Screws should always be oiled or greased before they are driven in. If the position of the screw admits, put some oil on the screw-head, and round it, and apply a little gentle heat; if in a position that does not admit of the application of the oil, heat the screw-head with the blow-pipe, and when it cools, it will be found easier to remove.

H. M. H. writes—and this is apropos to the enquiry made by TALIESIN JONES:—I might perhaps mention, in reference to a paragraph in "Ways and Means" (January Number) where a blow-pipe is recommended as a good way "to loosen screws rusted in," that whenever I have had occasion, I have always used a red-hot poker, and never failed to obtain a satisfactory result, even in the case of refractory *nuts*, when inaccessible to a spanner, with sufficient length of arm to obtain the necessary power. It is needless to mention, perhaps, but in the latter case, care must be taken that the red-hot poker is placed in contact with the *nut* only, and not allowed to touch the male screw.

Draught Table.

F. G. (*Peckham*).—Do not spoil the top of your polished mahogany table, but make a top of deal to fit over it, and veneer this with black walnut and holly for the draught board, surrounding the great central square with a border of lighter colour. For instructions on making a cheap garden frame that will be both strong and serviceable, see "Every Man His Own Mechanic," page 450. This is in Part VIII. of the work, which you can buy for 6d.

Price of Overhead for Lathes.

THE BRITANNIA COMPANY, *Colchester*, write to say that the price of their new overhead for lathes, noticed in "Notes on Novelties," in Part XVII., up to 4 feet is £5 5s., 5 feet would be £6 6s.

Designs for Wooden Chimney Pieces.

E. A. S. (*Saltash*) is thanked for sending designs for mantelpieces, but as the sheet sent consists of illustrations from the stock of Messrs. W. Walker and Sons, 119, *Bunhill Row, E.C.*, it is clear that it is not possible to reproduce them, beautiful as they are, as a supplement to this magazine. E. A. S. adds, that if F. T. (*India Office*) will address, as per initials given, 6, *Tamar Terrace, Saltash*, he will forward a book of designs for the use of himself and his friends.

Tennis Court Marker, etc.

M. H. W. (*Manchester*).—1. In laying out a tennis court, pieces of tape are frequently used. This is cheap and simple, and better than making marks on the grass with whiting or whitewash. 2. Better use up your small pieces of soap as far as you can. If you are determined to try to put them together, melt the pieces in a vessel set in a water-bath, and scent with any essential oil, for which you may have a fancy, adding it gradually, and stirring all the time. 3. A great deal has been said already in the pages of this magazine about varnish for different kinds of woods, French polishing, etc.

Electrical Matters.

J. J. K. S. (*Cannes*).—Dynamo-electric machines made up for the purpose give a better current for plating than that obtained from a battery. A Daniell is the best plating battery. Carbon, or best gas-coke, may be used in lieu of copper, if this metal is not obtainable. The process of single cell plating which you saw, is a slovenly and wasteful process, now almost obsolete. You will have seen some instructions for making a small induction coil; these will be amplified and improved in some future articles. If the needle of the galvanometer had been placed horizontally it would be too sensitive. The instrument is simply a vertical needle current detector, not an astatic galvanometer. Carbon pencils for the electric light are made by a process too difficult to be carried out by amateurs. Your flasks will make very good retorts wherein to carry on distillation of water, etc. The other matter shall receive attention.

P. J. H.—The articles on dynamo-machines have been delayed by pressure of other matter on the space at my command. The promise shall be fulfilled as soon as I can get elbow-room It is intended to enlarge, not only the coil, but the subject, at some future time. The cells must be coupled up to suit the resistance of the wire. A short thin wire will become incandescent with a current from four or five Bunsens coupled in series—*i.e.*, "intensity." Long thick wires will require large cells, or their equivalent in small cells coupled up for "quantity." I consider the arrangement known as Dale's to be the most powerful and constant.

G. A. M. (*Oakham*).—There has been either an article, or some information on the subject in this department, in every issue of AMATEUR WORK since its commencement. Are you not instructed as well as amused?

R. ROBINSON (*Rochdale*).—*The Wimshurst Electric Machine.*—It is not my intention to take up the subject of electric machines (for the present, at least), because other more important matters press for prior treatment.

C. P. (*Northampton*).—*Storage Batteries or Accumulators.*—Other readers beside yourself wish to know how to make up these batteries, and I may oblige with an article on the subject at some future time; but I would like to know from you all, what you really expect from a storage battery other than can be got from an ordinary voltaic battery? If any of my readers can show me that it would be useful to them, I will devote a little time to the subject.

G. A. M. BAKER.—*Hygrometer.*—The flagstaff may be as high as your taste may determine. Say 5 inches above the roof.

J. C. (*Leigh*).—*Electric Bell.*—You have not acted wisely in trusting to weight of armature alone to recover contact; in fact, it is just possible that the armature is too heavy for the magnet. Make a lighter armature; fasten a thin brass spring to the back, and attach that to a small post midway between the post that holds the contact screw and that which acts as a pivot to the quadrant carrying the hammer shaft and the armature. It will be well to attach one of the wires to this post instead of the pivot-post, and thus allow the latter more freedom of action. The brass spring may be bent to any curve, and with the adjusting contact screw be made to regulate the armature to any distance from the magnet. Respecting the telephone, I have understood that patent rights are not infringed unless the instrument is used for other than experimental purposes.

THOS. J. O'CONNOR and WATCH-JOBBER.—*Electric Clocks.*—An article is in hand on making Electric Clocks, and controlling clocks by electricity. This shall appear as soon as space can be spared for it.

ELECTRICIAN.—*Phonograph.*—The mouthpiece of the phonograph is formed in a similar manner to that of the telephone, with this exception, that a larger surface of the ferrotype plate is free to move in the former than in the latter, the plate being held between two rings at its circumference. The style may be made out of the blunt end of a needle soldered to a thin brass spring; one end of this is clipped by a screw near the circumference of the ferrotype diaphragm, and the other end carrying the style is free to vibrate behind the centre of the diaphragm. Full particulars cannot be given here, but I may resume the subject shortly.

PHOS.—The number of Fuller cells in series required to make the platinum wire white hot will depend in a great measure on the fineness and length of the wire. See reply to P. J. H. If you pack the outer cell of the Fuller with broken carbon it would be improved for the purpose required by you, and if the zinc rods were replaced by cylinders or rolled plates of amalgamated zinc a further improvement will be observable. Papers on making electro and other magnets will be forthcoming when space can be found for them.

DYNAMO-MACHINE. — Small Dynamo-machines for lighting from two to five incandescent lamps can be obtained for about £8 or £10 from Messrs. Oppermann, 172, *St. John's Street, London, E.C.*; Messrs. Patrick & Son, 529, *King's Road, Chelsea*; and Messrs. H. & E. J. Dale, 4, *Little Britain, London, E.C.*

MAKING CARBON FOR ELECTRICAL PURPOSES.—Were you a reader in an obscure corner of the world, I should feel much pleasure in assisting you to make the carbons, but I should do you or any other amateur residing in such a city as Manchester a wrong if I encouraged you to attempt the manufacture of carbon plates or rods. Carbon eminently suitable for your purpose is regarded as a drug in gas works; you may buy it in the rough state at a very cheap rate, and cut it up yourself. The process is a similar one to that mentioned by you, but why attempt it?

V. (*Ambleside*).—*Electro-gilding Solution.*—By using a weak battery and heating the solution to 160° Fah., using a strip of gold for an anode, you may gild articles in the solution as made up by you. You have failed in making it up right, but in this you have only followed in the track of others, and gilding is done with worse solutions. I hope to treat you and other readers to an article on Electro-gilding soon.

JOHN KEAN.—*Electric Light.*—You are heartily thanked by the writer of the article in question for your kindly criticism. His conclusions were based on experiments made with a small lamp reputed to be a Swan lamp, and information obtained from vendors of such lamps. He has since discovered that the lamp was not made by the Swan Company; but it is only right to say that the table relating to the Swan Incandescent Electric Lamps on page 462, Vol. I., was compiled from information obtained by a friend from the engineer of the company. It is however a fact, as you observe, that fully seven Bunsen cells in series is needed to develop a light of five-candle power in an incandescent lamp, and you might have added that few lamps of a stated candle power will bear enough current to develop the full light ascribed to them. It would be a bad set of ten sperm candles that did not give a better light than a ten candle lamp gives just when at its best, and before total disruption of the carbon.

Magneto Battery.

E. J. F. (*Dalston*).—If you will oblige with a description of your battery or machine, I will endeavour to render you some assistance. At the present time there are so many different forms of apparatus claiming the names of galvanic, electric, or magnetic batteries and machines, that it is necessary to see them, or an accurate description of each, before one can decide on their merits, or suggest means for improvements.

Dale's Granule Battery.

ELECTRIFIED LAWYER.—Thanks for your letter. I am pleased to hear of your success with the battery. The mercury did not oxidize, but formed an amalgam with the finely divided zinc produced in working the cell. Try an optician for the small iron tube. A larger condenser will tend to make a longer, brighter, and thinner spark. See reply to MAGNETO.

Where to get Electrotyping Materials.

W. J. H. (*Newton Heath, Manchester*).—Write to any of the gentlemen advertising under the following heads in AMATEUR WORK TRADES' DIRECTORY:—

"Electric Bells and Apparatus."

"Chemical Apparatus and Chemicals."

"Opticians and Microscope Makers."

Any of these, or any other advertiser of electric apparatus, will oblige you.

V. (*Ambleside*).—See reply to W. J. H.

Magneto-Electric Machine.

MAGNETO.—In reply to this and other correspondents, we may state that an illustrated description of such a machine is now being prepared by Mr. Edwinson, and will appear when we can find space for the article. Medical coils and pocket coils will also receive attention by the same author.

H. C.—See reply to MAGNETO.

A Cure for Damp Walls.

W. S. H. (*Richmond*).—Try the effect of a couple of coats of Pulford's "Iron Damp Wall Paint," which may be obtained at the rate of 6d. per lb., in quantities of not less than 7 lbs., at 77, *Cannon Street, E.C.*

Cleaning Shells.

A. B. (*South Wales*).—Rub the shells with a rag dipped in hydrochloric acid, and continue the process until the outer coat is removed. Then wash in warm water, dry in hot saw-dust, and rub with chamois leather to impart a polish.

Griffith's Patent Saw Blades.

J. T. F. (*Brixton*) writes:—I can add my testimony to that of W. R. C. (*Southsea*), that the above are par excellence, the finest blades ever brought out for fret-cutters. I have used every number from 0 to 10 inclusive, and they are a pleasure to work, every tooth being "set," the saw never clogs, and appears to fly through the wood, no ugly burr all on one side, as in the Swiss and German blades, to cause your saw to continually leap off the line. All I have introduced them to, declare they will use no other for the future; and yet what antipathy is shown to a new idea because it emanates from an American. I have tried nearly every shop in London for them, and without success; and in some places got roundly laughed at, and ridiculed for asking for such a thing. I enclose a piece or two for your inspection. Should you not have met with them, you will readily see the difference in the two makes. It may benefit our readers if I state they can be had from Messrs. Churchill, and from Harger Bros., *Goldielands, Settle, Yorks*, who first introduced them to me quite unsolicited

J. M. H. (*Alnwick*).—These fret-saw blades can be obtained from Messrs. C. Churchill and Co., 21, *Cross Street, Finsbury, E.C.*; Messrs. R. Melhuish & Sons, 85 and 87, *Fetter Lane, E.C.*; Messrs. Kent and Co., 293, *Euston Road, N.W.*; Messrs. Harger Bros., *Settle, Yorks*; Messrs. F. H. Sanderson & Co., 7, *East Road, Cambridge*; and from most dealers in hardware tools and carpenters' ironmongery in town and country.

Preservation of Eggs.

E. P. R. (*West Barnet*) writes:—In page 145 of the present volume of AMATEUR WORK, H. J. A. writes a long letter on the "Preservation of Eggs." He begins with this remark: "While wishing every success to your excellent magazine, may I be excused if I point out, what seems to me, a rather ridiculous remark," and he ends with the following: "When a paper is so good, a small fault is easily detected, and when a thing is so good, a fault is the less able to be borne." Now, I wish to show H. J. A., that in trying to make out W. B. J. ignorant and ridiculous, H. J. A. shows that he is evidently unaware that there is any other kind of paraffin besides the common petroleum which is burnt in lamps; now, if he had carefully read AMATEUR WORK from the commencement, he would know that there is a solid paraffin which has neither taste nor smell, such as is used to insulate electrical apparatus, page 186, Vol. I. It is a great pity that correspondents rush to pen and ink before they know what they are writing about; to *think* we are right is no use in a magazine like this; we ought to be positive. I hope others who see this correction will take the hint, and if they feel inclined to find fault with advice kindly given, that they will first enquire whether their own want of knowledge on the particular subject is not the cause, before they call the writer ignorant.—[Another writer, who hails from St. Augustine, Florida, U.S., has also commented on H. J. A.'s remarks.—ED.]

Printing for Amateurs.

R. D. (*Colinsburgh*).—In reply to your query I will do all I can to bring about a continuous appearance of the articles on "Printing for Amateurs." The third chapter appears in this Part. The specimen of printing that you send is most creditable to you, and far above the average of work turned out by amateur printers.

F. P. (*Woodford*).—Clean rollers should be kept in an air-tight box, and supported so that the composition does not come in contact with anything. The temperature should always be about the same as that of the room they are used in. If no air-tight place is available, roll up thickly in ink, and allow the ink to remain on the surface; when required again for use scrape off the ink with a blunt knife. If needed wash with turps or benzoline, and roll up thinly with fresh ink. The ink hardens into a skin which protects the roller.

CLERICUS.—It is intended to complete and supply all the articles on printing at an early date. They will then appear as rapidly as the editor can find space for them. The Eclectic Handbook of Printing, price 1s., published by the Birmingham Machinists' Co., contains practical information on both press work and composing. All who desire to better understand our articles should procure it.

Violin-Making.

H. N. (*Dundee*).—1. The thickness in the centre of the belly of a new violin should be $\frac{1}{6}$ inch. 2. The *edges* shown in the diagram allow for cutting *on* the outline in cutting out the model, and for subsequent operations which will tend to reduce them. It is always good to have strong edges on a new fiddle. 3. The wood for the mould should be $1\frac{3}{4}$ or $1\frac{1}{2}$ thick, and then be planed down as prescribed on p. 266, to $1\frac{1}{4}$ in. at the top and $1\frac{5}{16}$ at the bottom. 4. "Violin-Making: As it Was, and Is," began in Part II. of AMATEUR WORK, and has continued ever since.

J. F. (*Abergavenny*).—1. The sinking, or cupping, round the edges is not shown in the arching models, but will be produced as set down in a future chapter. 2. See answer to J. V. (*Dublin*). 3. The thicknesses must be arrived at, as will be explained in a future chapter. The thicknesses given are taken from an old and seasoned Strad.

J. SKINNER, (*Ealing Dean*).—I shall be happy to see your fiddle, and give you an opinion on it if you will leave it at Mr. W. E. Hill's, in Wardour Street, before 5 p.m. on the first Wednesday in May.

K. C. (*Bradford*).—The best books on the violin are by Hart, Dubourg, Sandys and Forster, and Davidson. They may be had of any bookseller. My opusculum on the violin was printed in limited edition for private circulation only.

EPIDERMIS.—1. Your first query being on a subject foreign to AMATEUR WORK cannot be answered in the pages of this Magazine. The proper course for you to adopt will be to apply to a medical man, who will tell you all you wish to know on the subject. 2. You are quite right, the length of the bow (20 in.) in the January number, is a printer's error, it should, of course, be 30 inches.

W. F. (*Paisley*).—The Colin-Mezin violin is not by any means inferior to any violins of modern manufacture as regards their workmanship. They are, however, made in large quantities, and do not aim at being anything more than a first-class, and well-fitted warehouse violin.

R. R. L. S.—Hopf is an inferior German maker. His violins which are manufactured wholesale for the trade, are hardly superior to the Mirecourt fiddles.

G. B. T. (*Folkestone*).—I should advise you to get "The Violin: How to Master it. By a Professional Player." (London, 1882, Simpkin, Marshall.) And Baillot's or De Beriot's Violin School.

F. J.—You will find the information you want in Vol. I., Part IX., Answers to Correspondents.

SOUND-POST. — Turner is a somewhat obscure English maker. His violins, which are of second-class, have but little value.

Dulcimer Making.

CONSTANT READER, P.—A piece of oak is to be fixed on each side, and come up flush with the top and bottom pieces; this forms a ledge all round. What need for pieces to be put on all four sides? The belly is all in one piece, and screwed on to the top and bottom; the wires, when put on, will hold the sides down.

H. STONE (*Argyllshire*).—Yes, you may make a dulcimer less than the one described, but I should prefer one about two-thirds the size, as if you made it half the size, the wires at the top would be so very short. I, like you, should be very glad if someone would give instructions for making a zither.

PATTERN-MAKER.—I can speak for beech and oak, having used both with success. The wood used requires to be so hard as to bear the pegs driving pretty tight in, and resist the strain when the instrument is being tuned.

F. Y. DRUMMOND.—You are right, the top piece must be 26 inches long, and not 20. I made the mistake, and did not notice it until pointed out by you. I am glad to hear you have succeeded in making one, as, until just before writing the instructions, I had always made the instruments smaller, and with only one bridge, the middle one; but, seeing that the instrument could be improved, I made one a little larger, and introduced the other two bridges and half-notes; with what success you already know.

Lily Mirror.

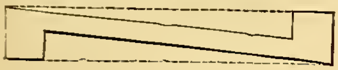
J. M. H. (*Alnwick*).—Ordinary silvered glass is, of course, to be obtained at any oil and colour warehouse, or upholsterer's, but the bevelled at only a few places. The "Furniture Gazette," published weekly, generally has advertisements of these. See Part XIII., Page 98.

Bachelor's Sideboards.

B. E. C. (*Shadwell*).—Mahogany ebonises well, and works fairly clean. I have just had a carrier made in it, but did not ebonise it myself. The back numbers of AMATEUR WORK contain several directions for doing so. Page 43, Vol. I.

Adjunct to Carpenter's Bench.

A. K. (*Soham*) writes:—The adjunct to carpenter's bench mentioned by HALF JACK,



is used by most carpenters, but it is not made with three pieces of wood, as he states; it is cut out of one piece, as in the annexed diagram.

Simple Holdfast Bench Stop.

JACK HORNER writes:—I send you a description of a simple holdfast bench stop. It is not, I believe, a new contrivance, although it does not seem to be very extensively used. It consists of a piece of iron

FIG. I.—IRON FOR BENCH STOP.

or steel about 6 inches long, $1\frac{1}{2}$ inches broad, and less than $\frac{1}{8}$ inch in thickness, toothed at one end, slightly bent, and fixed in the manner shown in the figure. It grips

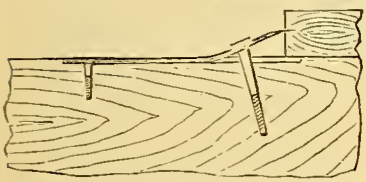
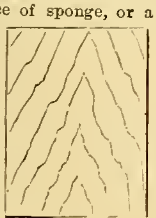


FIG. 2.—DIAGRAM SHOWING USE OF BENCH STOP.

the wood without the aid of a bench-knife, and keeps it from drawing back with the plane, and when necessary, may be screwed down quite flush, so as to be out of the way.

Staining Wood.

W. J. S. writes:—A good stain for wood in imitation of black ebony, is oil of vitriol diluted with water, rubbed on the wood and held before the fire until it is dark enough. To stain wood in imitation of rosewood: Boil chips of logwood in water, allowing the water to boil until there is very little of it left; then add more water, boil again and rub it on the wood as hot as you can. Then take a solution composed of iron nails steeped in vinegar, and trace the grain of the rosewood on the red stain with a pointed stick. This will turn black, and serves, as I have said, to show the darkest markings of the grain, knots, etc. Next take a small piece of sponge, or a fine brush, and draw it from top to bottom of the black lines on one side of them, as shown in the annexed diagram, shading it gradually as it approaches the black line next in order. When polished, the effect will be found to be extremely good, and a close imitation of the real wood.



MARKINGS ON STAINED WOOD.

[In doing anything of this kind, the amateur should have a piece of the wood he is imitating before him, to serve as a guide to the natural markings.—ED.]

Appliances for Brazing and Soldering.

ALPHA writes:—Whilst the papers on Brazing and Soldering are now being printed in your paper, perhaps I may venture to give you a description of two pieces of

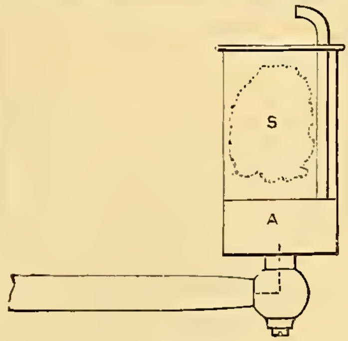


FIG. I.

S, Sponge saturated with spirit; A, Air-box.

apparatus I use for the purpose. The accompanying rough sketch will give an idea of the great advantages it has over the ordinary rushes, especially for gas-fitting and making joints in water pipes, even

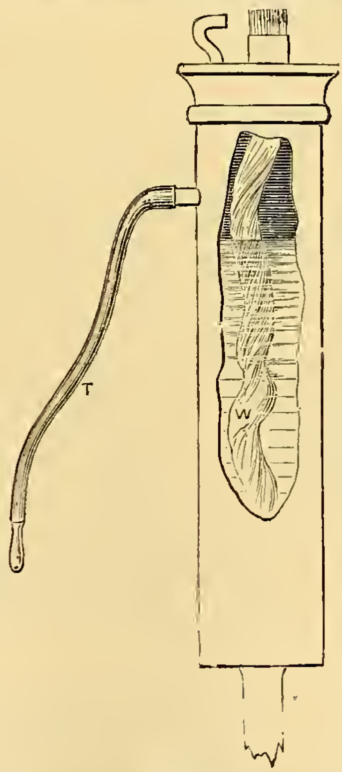


FIG. 2.

W, Methylated Spirit; T, India-rubber Tube.

where pressure (hence strength) is required; the apparatus, Fig. 1, is made by Mr. Hughes, of 22, *Chichester Road, Kilburn*, and consists of an ordinary pipe jet and blow-pipe. The handle of the jet is cut off, and a hole drilled through until it meets the hole in the plug; one end of the tap is stopped, and to the other a portion of the blow-pipe is affixed; the top (where the handle was) is screwed into a plate of brass, which forms the bottom of the air box, as will be seen by the figure. The other is very simple and needs no description. The one illustrated in Fig. 2 was lent me by a friend, and I do not know the maker; the other answers well both for brazing and soldering.

INFORMATION SUPPLIED.

Soldering Solution.

T. J. O'C. (*Dundalk*) writes:—I see a great many questions asked about this solution, and all seem to recommend muriatic acid. Certainly this acid does its work well, but the vapour caused by the iron, affects the eyes very much. In soldering tin, nothing is better than powdered resin, as it does not cool the iron so quick as the fluids, but for iron, brass, zinc, etc., Baker's preparation is good, and does not affect the eyes in the least degree. For soldering gold, use Venice turpentine.

Prize Holly Fret-Machine.

F. B. (*Bandon*) writes in reply to W. C.:—I beg to say I have been using the "Prize Holly" fret-machine for over twelve months, and have done some very particular, as well as some heavy sawing. I cut mahogany nearly one inch thick with No. 4 Griffith's saw blades. I would strongly recommend W. C. to get one of the above, it saws very well indeed; all I had to do with mine since I got it, was to get the under-arm renewed.

Hand-Bells.

SELF-HELPER recommends WILLING TO HELP to try Goff, 22, *King Street, Covent Garden*. Almost anything can be got from him, and if you send him a couple of stamps, if he has not a set on sale, he will doubtless obtain you a list; he is most obliging.

Metal Organ Pipes.

J. G. H. in reply to A. Z., sends the following synopsis of prices of metal organ pipes supplied by Messrs. Robert Allen and Co., Organ Metal Pipe Makers, 16 & 17, *Phippen Street, Bristol*. 8 ft. Metal Stops—C C, £11 10s.; Tenor C, £3; Fiddle G, £2; Middle C, £1 5s.—Gamba, or Keraulophon—Tenor C, about £4. Principal—C C, £3 3s.; Tenor C, £1 10s. Fifteenth—C C, £1 14s. Stop Diapason—Tenor C, £1 15s. Voicing any of the above—C C, £1 15s.; Tenor C, 15s. Keraulophon—Tenor C, £1 5s. Spotted metal, 20 per cent. additional.

Nitrate of Silver Stains.

E. G. J. (*Plymouth*) sends the following reply to F. A. E. (*Newtownbutler*):—Nitrate of silver stains may be taken out of linen, by first painting the spots thoroughly with tincture of iodine, and then after the lapse of an hour or two, going over the spots again with a saturated solution of hyposulphite of soda; the linen should then be rinsed in clean water. I have found this process answer perfectly, in cases when I thought the linen entirely spoilt; tell it not to the laundress, but marking-ink stains may often be taken out in the same way.

[Pages 347—354 form Supplement to this Part.]

Circular Saw Table.

F. W. E. (*Southport*).—Perhaps the rough sketch I send will help J. R. K. The wood should be hard, and not less than ⅝ inch

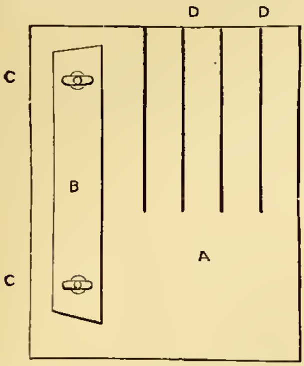


FIG. 1.—SKETCH FOR SAW TABLE.
A, Surface of Table; B, Guide or Fence; D, Slots for Saw.

thick, and the guide preferably of metal, though hard wood will do. For a 6 inch saw, the table should be about 15 inches long and 10 inches broad. A plug similar to that of a T-rest should project

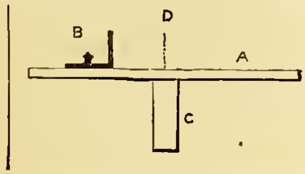
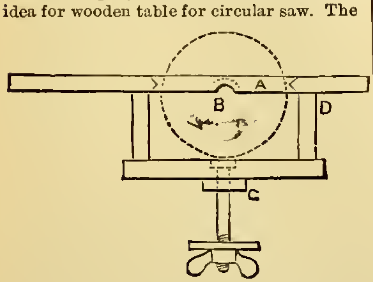


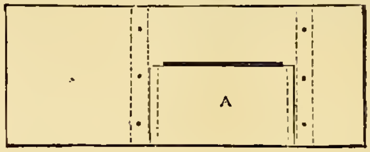
FIG. 2.—SECTION OF SAW TABLE.
A, Surface of Table; B, Guide; C, Plug; D, Saw.

from the under side of the near end of table, and will fit into the rest socket; this can also be made of wood, and screwed to the table, as in section. Care should be taken that the slots for the saw do not reach as far as the plug.

AMIGO. (*Pembroke Dock*) sends the following reply to J. R. K. (*Islandmore, Croom*). The accompanying sketch illustrates an idea for wooden table for circular saw. The



elevation, Fig. 1, will show the construction at a glance. The bolt belonging to T-rest may be employed for fastening down. To get the saw in place a moveable piece must be fitted in table as shown at A, Figs. 1 and 2. Clearance for the spindle must be cut as shown at B, so that the saw may be kept as high as possible. Instead of the sliding piece A, a hinge may be fixed at D, and the table tilted back to allow the entrance of the saw; when lowered, it can be secured in front by means of a pin. When once the table is set in relation to the saw, a tongue, C, fitting between the sides of lathe bed, should be screwed to under side of frame;



this will prevent delay in future usage, as the table can then be dropped into place right off. If J. R. K. has plenty of centre height he may get the saw in without cutting or hinging the table. I have similar gear to my lathe, made of ⅝ inch mahogany, and it answers very well with 4 inch centree.

Table for Circular Saw.

HEREWARD sends the following reply to J. R. K. (*Islandmore, Croom*) who is very vague in the description he gives of his lathe; he does not so much as tell us the

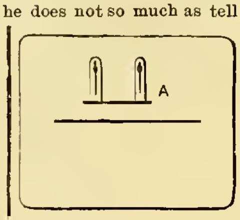


FIG. 1.—TOP OF TABLE SHOWING FENCE.
A, Movable Fence.

height of centre, but supposing it to be about 5, or 4½ inches, the plan shown in the accompanying illustrations will suit him admirably. Although not handsome, it is very strong, and will bear almost any weight upon the table, this in itself is

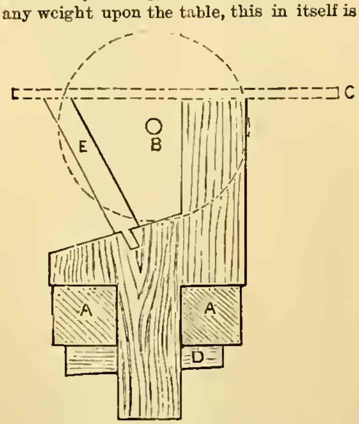


FIG. 2.—END VIEW OF TABLE.
A A, Bed of Lathe; B, Saw Spindle; C, Table Top; D, Wedge to tighten Table to Bed; E, Support for Table.

a great advantage; besides, it is one he can make himself, and all of wood. A glance at the plan will show him how it is made, the shaded parts are cut out of a solid piece of wood, or two pieces screwed together in a line with the saw; all this can be done with the hand-saw. He can either screw or mortise the table top to the stand, this likewise implies to support E. If he requires a fence to his table, Fig. 4 is a very good one, and easy to make; A is 6 inches long

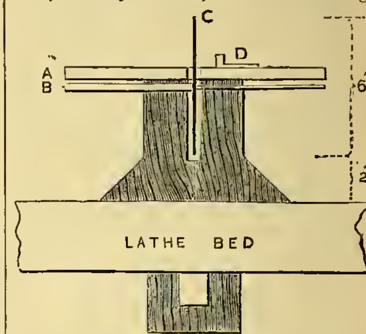


FIG. 3.—FRONT VIEW OF TABLE.
A, Table Top; B, Saw Spindle; C, Saw; D, Fence.

and 1 inch by 1; B fixed to it upon the bottom side, the screws regulate its distance from saw. The rough sketch is not to scale, but of course, J. R. K. makes working-drawings of any job he is about to

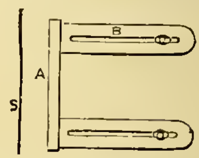


FIG. 4.—MOVABLE FENCE.
A, Fence; B, Slot for Screw; S, Saw.

undertake; if not, I should certainly recommend him to do so with this, suiting details to his lathe.

J. C. (*Stoke Newington*) sends following reply to J. R. K. (*Islandmore, Croom*):—In the accompanying illustratione, Fig. 1 ehows

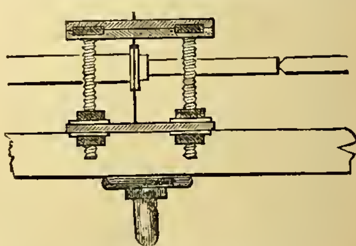


Fig. 1.—Front Elevation.

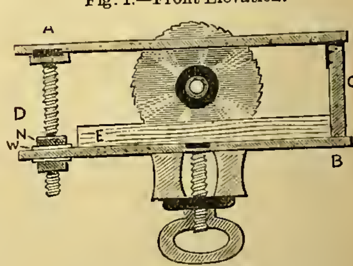


Fig. 2.—Side Section.
TABLE FOR CIRCULAR SAW.

the front elevation and Fig. 2 the side section of a table for a circular saw. Plan consists of: deal framing; A, top; B, bottom;

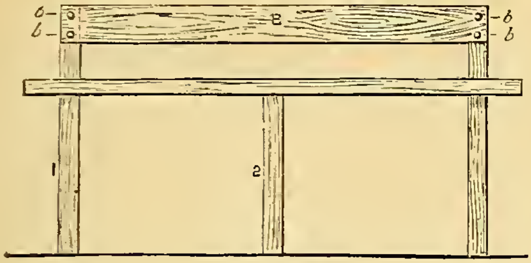


FIG. 1.—FRONT ELEVATION. Scale, $\frac{3}{4}$ in. to 1 foot.

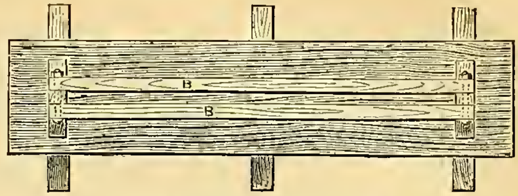


FIG. 3.—PLAN.

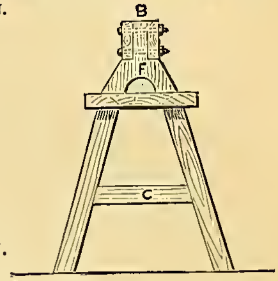


FIG. 2.
END ELEVATION.

THREE ILLUSTRATIONS TO BENCH LATHE SENT BY AMIGO.—*See p.* 350.

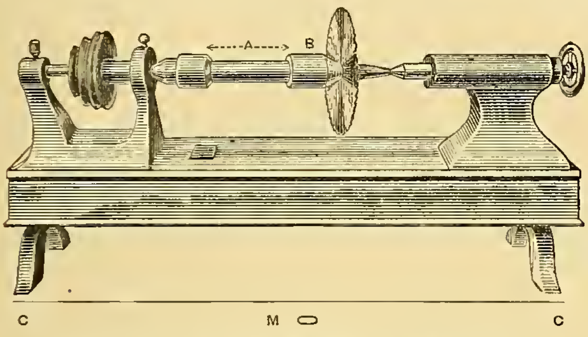


FIG. 4.—EUREKA LATHE, SHOWING SAW MOUNTED.
A, Lengthened Mandrel; B, Tapering Chuck; C, Edge of Lathe Table.
M shows where K of Fig. 3 is fastened.

10 inches long. 8 inches long.

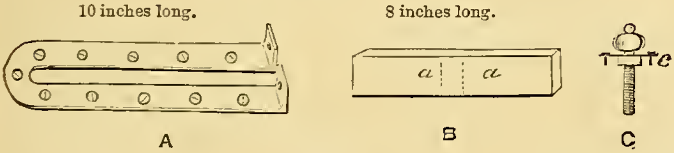


FIG. 1.
A, Piece of sheet iron to be fastened with small screws on wood of same shape.
B, Piece of $\frac{3}{4}$ oak (planed true) fixed at right angles to A at *a a*.
C, Thumb-screw which fastens whole guide; *c*, small plate let into the table, and in which C screws.

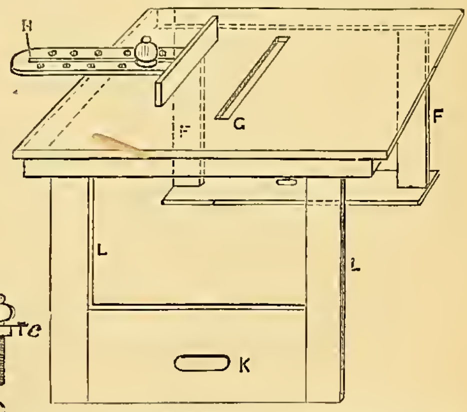


FIG. 3.—TABLE WHEN REMOVED FROM LATHE
F, F, Stands let into wooden plate fastened to lathe table by thumb-screw; G, Slit for saw; H, Sliding Guide; K, Piece of wood fastened by thumb-screw to edge of lathe table, and to saw table by legs L, L.

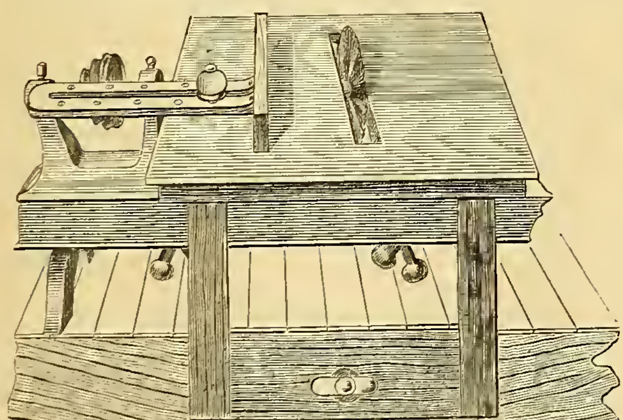
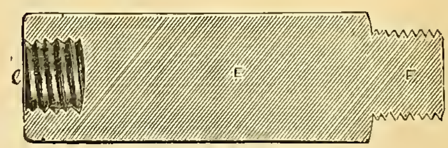
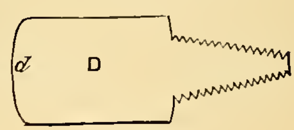


FIG. 5.—SKETCH OF LATHE SURMOUNTED BY SAW TABLE.



5 inches long, excluding screw.



$1\frac{1}{2}$ in. long.

FIG. 2.
D, Tapering chuck on which saw is mounted, and screwed up tight with nut and washers; E, Piece of turned steel, 5 inches long, with female screw, *e*, to fix on mandrel, and male, F, on which chuck, E, with screw cut at *d* is fixed.

EIGHT ILLUSTRATIONS TO CIRCULAR SAW ON LATHE SENT BY E. A. F. (*Cromer*).—*See p.* 350.

C, back; A is hinged to C to the back (long tail hinges), and supported in front by ⅜ in. bolts, tapped whole length, each with two nuts and washers, as shown D. Bolts are fitted to A by a fillet, the heads of bolts sunk into fillet and under side of A, and fillet screwed on. E shows narrow strip, to form tray to catch sawdust. The whole held on to lathe-bed by bolt (passed through B) from T-rest holder. If nuts are made to run easy on bolts, they may be tightened and set by the fingers.

GRAHAM writes in reply to J. R. K. (*Croom*):—Use an ordinary box with a lid hinged to the front and overlapping all round, holes being cut in the sides to admit the saw-spindle. Screw a tenon on the bottom to fit the lathe bed, and use a holding-down bolt as usual. Fit to the back of box a screw to raise or lower the lid. When made, put box in place with lid open, close it gradually, so that the saw cuts its own kerf, the spindle being mounted between centres. An article on saw-tables is in hand, vide reply to E. P. H., p. 197.

Circular Saw on Lathe.

E. A. F. (*Cromer*) writes:—In reply to E. P. H. (*Surbiton*), who seeks information about mounting a circular saw on his lathe, perhaps the following, as done by my brother and myself, may be useful: We have a "Eureka" 5 inch lathe, and had a 4 inch circular saw we wished to mount. We first of all mounted it on a small chuck (1¼ inch long) with a tapering screw and a nut, to take emery-wheels, etc.; this, of course, we found to be almost useless, as it allowed so little space between the saw and pulley, so we got our ironmonger to have a piece (5 inches long, excluding screw) turned with a male and female-screw to fit the mandrel and chuck; we then brought the back poppit up to the end of the chuck (which is bored also for small drills), and our saw was complete. E. P. H. should be careful to get his saw *properly* set and sharpened. The table we made of $\frac{5}{16}$ inch walnut, with thin deal screwed on it across the grain underneath, to prevent warping, making a slit for the saw; it has two supports at the back, let into a thick piece of wood, which is fastened to the table by an ordinary thumb-screw, the other end is the same, but as it projects over the lathe-table, the thumb-screw fastens it to the edge of the table; the whole table is 22 inches long by 15¾ inches wide. As a guide, we have a piece of sheet-iron with a slit, on the end of which is fastened a piece of ¾ inch oak, about 8 inches long (we secured the iron on a piece of wood to make it firmer) the whole works up and down by another thumb-screw. The whole thing can be detached from lathe in less than five minutes.

Bench Lathe.

AMIGO sends the following reply to W. H. (*Rosses*):—I am led to believe, from the wording of the query, that W. H. does not possess a bed for his headstocks, etc., and therefore send sketch of wooden bed as well as stand. I propose wood, as being an easy material to work in as well as readily come-at-able. If W. H. prefers iron I will give him a sketch of a simple form to suit, but I may observe that I have seen far heavier lathes mounted on wood, and some very heavy work done in them. With reference to the sketch, Fig. 1 is a front elevation, Fig. 2 an end elevation, and Fig. 3 a plan of the fixings required. B is the bed, made of oak or other well seasoned wood, two lengths 6 inches by 9 inches by 6 feet long, bolted together at the ends with ⅜ or ½ inch bolts *bb*, embracing the feet F, as shown. The bed and feet need not be fastened down to the stand unless very shaky in the construction. The stand should also be made of oak well fitted together with cross bars between the legs, as shown at C, Fig. 2. The cross bars at 1 and 2, Fig. 1, will also have to carry the fly-wheel, and must have plates fitted on the inside to carry the centres for the spindle. For the rocking shaft of the treadle, bearings must be fixed to the back legs, and the shaft can be carried right along the three and a treadle fitted between each pair of legs, if a long bed is required. The legs—especially 1 and 2—should be bound together under the feet by strong hoop iron, so that the lateral pressure of the fly-wheel spindle may be resisted. The hoop iron can be let into the feet flush or even with the sole, so that the stability may be maintained. The stand may be made a foot or so longer than required, so that a vice may be fixed at one end. This would be found very handy in connection with the work. I shall be most happy to furnish any further information, if required.

Cycling Matters.

W. B.—In America they strap a bag or a parcel of books on top of handle bar of bicycle, I have not yet seen any contrivance for holding a bag in this country. It would not be difficult to make some fastening for a bag, but the bag would be of very limited capacity. As to the construction of the bag itself (saddlery is quite out of my line), W. B. should consult Lamplough & Brown, *Great Colemore Street, Birmingham.*

F. M. (*Gray's Inn Road*).—About the best place to buy all material for tricycles is J. Devey & Son, *Wolverhampton.* Large rims 3s.; small 1s. 6d.; finished hubs, large, 10s. to 12s. 6d.; small 4s. to 5s; spokes, straight and headed, 4s. per set. Send for Devey's price list.

J. (*Peterhead*).—Such a machine as I speak of is known as the direct action National Royal. Its advantages are, less weight and fewer bearings than a chain-geared tricycle. The rider is also directly over the cranks, and has great power in propulsion. Its disadvantages are great height of seat, consequently centre of gravity very high. For careful steering by a trained rider the machine is very good, but sudden turnings or accidental turning of the steering handle is almost sure to result in a side spill. In this respect my opinion is it is less safe than a bicycle, unless the progress is very slow. The steering wheel is always in rear.

Truing Grindstone.

T. J. O'C. (*Dundalk*) writes:—DELTA asks for information as to the truing of a grindstone. I have often trued up mine quite true with an old file, but if he procures a piece of granite stone, it will do the work equally as well, if not better.

Brass Chessmen.

GRAHAM writes in reply to K. W.:—Try Wm. Tonks & Son, *Moseley Street, Birmingham.*

Ramrod Fixed in Gun Barrel.

GRAHAM writes in reply to W. H. C.:—Pour into the barrel some olive oil, take hold of end of ramrod with a hand-vice, and try to turn it one way or other. If this wont do, take off the breach and push the rod out from that end.

Cutting and Gilding Picture Mounts.

SELF-HELPER (*Bradford, Yorks.*) replies to RISHTON as follows:—The tools used to cut mounts are (1) a mount-cutting knife; this is a straight piece of steel, with the end brought to a sharp cutting edge, and pointed, and is fastened into a suitable handle with a screw; it may be made by an amateur for about 8d. or 10d.; but I could never buy one for less than 2s., and have been asked 3s. 9d. for one. (2) A steel straight-edge, 2 to 3 feet long, and with one bevelled edge, a ruling pen, pencil, and a foot rule. Commence by trimming your *cardboard* (which will cut white through the whole thickness; for common work, or where it is to be a gilt bevel, common mount board will do, this does not cut white all through) to the required size, allowing for margin wanted; mark out the size of your mount exactly in the centre with faint pencil mark, then take your straight-edge and place the edge sufficient distance from the mark, to give the proper angle to the bevel. After making sure all is firm, take the mount-cutting knife in your hand, in the same manner you would take a dagger, when making an imaginary stab downwards, enter the point at the farthest end of mark from you, and make a firm clean cut towards you, turn your board round and repeat each side in the same way, taking care to cut well up into the corners; if round or oval mounts, use your compasses, and proceed accordingly, always cutting towards you. Gold ink made as follows, is often used for the gold lines round mounts:—24 leaves of gold, ½ oz. bronze gold, 30 drops spirits of wine, 30 grains pure honey, 4 drachms gum arabic (white), 4 ozs. rain water; the gold must be rubbed with the gum and honey, and the whole mixed with the water, and then add the spirit. Put on with ruling-pen, with aid of straight-edge, or in case of oval, use a pair of compasses with the pen in. Gold-leaf should be used for the bevel for good work, but instructions on this point must be reserved for a future occasion.

Polish Used by Chair-Makers.

J. B. (*Hereford*) sends the following to A YOUNG AMATEUR:—For best work—½ lb. white shellac, 1 pt. spirits of wine; this is quite a white polish, if darker is required, use yellow shellac. To put a gloss on commoner work—½ pt. spirits of wine, 2 ozs. benzoin; mix and strain through a cloth, apply with brush. Common varnish for legs, etc.—1 pt. methylated spirit, 1d. worth of resin. I obtained the above from a professional polisher in Oxon, and if A YOUNG AMATEUR would like to get them ready mixed, and will write to me, I will give him his address.

Collapsible Metal Tubes.

M. W. (*Burnley*), in reply to F. V. R. (*Witham*), writes: — The makers of the collapsible tubes are H. Brooks & Co., *Cumberland Market, N.W.* But I do not know if they sell small quantities.

Browning Guns.

M. W. (*Burnley*) writes in reply to GUN BARREL:—Tincture of perchloride of iron, ½ oz.; spirits of nitric ether, ½ oz.; sulphate of copper, 2 scruples; rain-water, ½ pt. Apply with a sponge, after cleaning the barrel with lime and water. When dry, polish with a stiff brush.

Cleaning Shells.

M. W. (*Burnley*) writes in reply to H. D. E.:—I have found a solution of carbonate of potash most useful for the purpose. 1 oz. to the pint of water.

Matches to Light Only on the Box.

I. O. H. (*Ballymena*), in reply to N. A. R., writes: — Take of chloride of, potash, 4 to 6 parts; bichromate of potash 2 parts; ferric oxide, 2 parts; strong glue, 3 parts; mix thoroughly, and use in the usual manner. Matches made by this method will not ignite on sand-paper, or by ordinary means, but require a surface specially prepared for them as follows: sulphide of antimony, 20 parts; bichromate of potash, 2 to 4 parts; oxide of iron, lead, or manganese, 4 to 6 parts; glass-powder, 2 parts; strong glue, or gum, 2 to 3 parts. This preparation is spread like paint in a warm condition on paper, which is fastened on the boxes containing the matches.

Ramrod Fixed in Gun-Barrel.

W. J. H. (*Wood Green*) sends the following reply to W. H. C. (*Wrotham*).—Pour some oil into the barrel and let it soak for a day. Screw a hand-vice or the nipple wrench on to the ramrod, and put in a door or some place for a purchase; a smart pull by two or three men will probably suffice. Or, proceed as above, screw the gun (by the stock) into a bench-vice, and by a series of gentle taps with a hammer on the small vice that is fixed to the ramrod, the rod may be drawn. Blowing out, as advised by SECOND ENGINEER, is very risky.

Hard Vulcanised India-rubber.

J. A., Junr. (*Croydon*), sends the following reply to ROGER (*Swadlincote*).—I have used vulcanite for fret work and find it answers very well. It is rather brittle and splits somewhat easily. It is supplied by the Britannia Rubber and Kamptulicon Co., 32, *Cannon Street, London*, and cost 4s. per pound. It is kept in all thicknesses from about $\frac{1}{32}$ inch upwards, and is sold in large sheets. If only a small quantity is required, the Company will not break a sheet, but if they have one already broken they will cut any sized piece off it.

W. J. H. (*Wood Green*) sends the following reply to ROGER (*Swadlincote*).—Fret-sawing was done in above at a stall in the (late) Polytechnic Institution, *London*, and the articles (mostly comic sketches) turned out very nicely, and sold, mounted on small strips of mahogany, from 3d. each. ROGER should try some of the manufacturers of vulcanized India-rubber, there is a mill at Edinburgh.

Vox Humana Stop.

J. W. H. (*Guernsey*) in reply to MUSICUS, writes:—The Vox Humana is a reed stop of 8 foot tone, the largest pipe CC about 15 inches long (or less, occasionally longer, but 15 inches is its true length); the reeds are similar to (and of precisely the same length) those of the clarinet or trumpet, they are generally somewhat thinner to enable them to speak freely on their diminutive bodies. The price of a Vox Humana in pure tin, voiced and tuned (the voicing would be far more difficult to the tyro than even the construction of the pipes) is £5 16s. at the most celebrated makers of these stops (identical with that placed in the Temple Church organ when rebuilt by Robson). The space required about that for a "Principal." It must be directly over the pallets so as to catch the first "flush." If the organ in which it stands is subject to great changes of temperature, and is usually played upon in a somewhat more heated atmosphere than its normal one, tune the Vox-Humana, note by note, to the open 8 foot, leaving each about a beat sharp —afterwards adjusting it in octaves to itself; when the temperature rises it will be in tune. Tuned perfect, it would be several beats flat, the same obtains of all reeds more or less, but the tube of Vox Humana being so short in proportion to reed, renders some such method of tuning indispensable where subject to heat.

Hand Bells.

F. E. W. (*Burford*) in reply to WILLING TO HELP'S inquiry for list of prices of hand bells, advises him to apply to Mr. Henry Bond, Bell Founder, *Sheep Street, Burford, Oxon*, for his price list. Mr. Bond's prices, he thinks, will be found as low as those of most makers.

W. F. I. writes:—I think if WILLING TO HELP writes to the firm of Messrs. John Taylor & Co., Bell Founders, *Loughborough, Leicestershire*, for their catalogue, he will get what he wants. The firm sent "Big Paul" to London. They also offer peals of hand bells from 8 in number, at £1 12s., to 37 in the peal for £35 15s.

Bookbinding.

F. G. (*Cornwall*)—How to bind AMATEUR WORK in the publisher's covers, is answered in the last paragraph on "Bookbinding" in Part XVI. The wires seen in the backs of books lately, instead of thread, is done by a machine costing over £150, quite beyond the reach of amateurs. However, should F. G. feel interested, a description of the machine will be given.

A SUBSCRIBER, no doubt, saw the illustration of Harrild's press and plough, in "Art of Bookbinding," p. 58. The address of the firm is Messrs. Harrild, 25, *Farringdon Street*. The illustration of press and plough in Part XVI. is almost the same; the press, Fig. 11, p. 362, Vol. I., is the same description, but smaller, made to suit the convenience of amateurs. The best advice I can give to A SUBSCRIBER, and to amateurs in general, is, have nothing to do with second-hand presses, unless they have been replaned, and have slide knives to the plough.

Flat Steel Wire.

W. S. S. can procure flat steel wire, as formerly used in crinoline hoops, from Messrs. J. W. Woodsworth & Co., Oxspring Wire Works, Sheffield. He will, however, find that the steel used is too soft for saws, and by the time he has filed or punched teeth, which, I presume, he intends to do, and got the right temper for his saw-blade, he will have wasted far more time than the price of a good French band-saw blade or fret-saw would be worth. Regarding price quoted for a band-saw blade, brazed, set, and sharpened, viz., 1s. 9d., either there must be some mistake, or else the blade is very short indeed. The other prices quoted by W. S. S. are correct, and will be found to tally with all those of first-class makers. He will, however, most probably be able to get about fifteen per cent. taken off, or perhaps more. The tool recommended by W. S. S. for running beads or flutings, would work well enough so long as it is not attempted to do too many at a time, as the spaces are liable to become variable in the sharpening of the cutter in this latter case. If a variation in the size of the beads or flutings is of no consequence, of course any number in reason may be cut with the same tool at one time.

Fittings for Fret-Work.

Messrs. CHARLES CHURCHILL & Co., 21, *Cross Street, Finsbury, E.C.*, writes:—MUSJICE asks for the fittings for fret-work, hinges, catches, locks, etc. Some of these are shown on page 96 of our catalogue, and we are adding others this season.

Ribbon of Bruges.

CORNELIUS NEPOS writes:—G. E. I. means ribbon of Bruges. It is made as follows. Make *two* tinctures in separate bottles as below:—

No. 1.

Orris tincture	¼ pint.
Gum myrrh	½ ounce.
Gum benzoin	2 ounces.

No. 2.

Alcohol (16 over proof) ...	½ pint.
Pod musk	¼ ounce.
Otto rose	½ drachm.

Cork both bottles and leave them one month. Take 100 yards of *cotton* tape and dip it in a hot solution, saltpetre, 1 ounce; water, ½ pint; dry it. Filter the *two* tinctures, mix, dip tape in it and dry it; it is then ready for use.

Brazing and Soldering.

A. K. (*Soham*) writes:—In the article on "Brazing and Soldering," by Mr. Edwinson, he has not mentioned Baker's Preparation for Tinning and Soldering. I have used it for many years as a flux for soldering every kind of metal, and have found it superior to every thing I had previously used.

White Mounting Boards.

WHITE MOUNTS (*Notts.*) in answer to G. P. P. writes that he can supply him with six-sheet white mounting boards at very low prices. If G. P. P. will send stamped envelope, addressed to himself, he shall have name and address of WHITE MOUNTS.

INFORMATION SOUGHT.

Nixey's Crystallised Fuller's Earth.

J. Graham writes:—Can you or any of your readers kindly inform me where I may obtain "Nixey's Crystallised Fuller's Earth?" I have tried several well-known druggists, but hitherto have failed to get it.

Varnish for Pasteboard.

S. H. (*Derby*) writes:—Can you give me a recipe for making white varnish, the kind that pasteboard box-makers and window-ticket writers use? it is a kind of enamel.

Condensing Lens for Magic Lantern.

J. W. (*Cottenham*) wishes to know if a combination of four lenses belonging to a quarter-plate camera can be converted into a condensing lens for a magic lantern; and, if so, how to find the focal length for focussing-glass?

Gas-Black as Ebony Stain.

C. (*Islington*) asks:—How can I use gas-black as an ebony stain? if I add turpentine, will that suffice; and, if so, in what quantities?

Glass Fittings for Epergne.

A. K. (*Soham*) who has been successful in cutting out the fancy epergne, for fret-cutting given in Supplement to Part XIII., wishes to know if he can gild it by dipping it into strong size, and then going over the whole with gold paint; also, where he can buy the nine glasses needed for it, and price? He would like them ruby-coloured.

Removal of Ink Stains from Ivory.

H. A. D. (*Belfast*) wishes to be informed how he may remove ink stains from ivory.

Liquid Damp-Proof Glue.

J. B. (*Jubbulpore*) wishes for a good receipt for a liquid glue that will withstand damp during the monsoon weather in Eastern India, where the damp is so great that articles veneered or glued together give way, and the veneering falls off. J. B. also wishes for receipts for making the coloured inks used with rubber stamps. [The inks are prepared from aniline dyes. For damp-proof glue, try the glue manufactured by the Gloy Company, see Amateur Work, p. 241, Vol. II., "Notes on Novelties."—Ed.]

Centre-Board Dingy,

J. S. E. Wishes to know if there is any book by which he could work out or find the lines for a good Centre-board Dingy, sea-going.

Enlarging and Diminishing Drawings.

A. Z.—See instructions on this subject in "Overglaze Painting on Porcelain," in this Part.

Re-Bronzing Figures.

E. L. J. (*Birmingham*) writes:—I have several French figures that require re-bronzing, the colour of the bronze was originally very dark. Could you kindly direct me how to re-bronze them?

Wax Casting and Moulding.

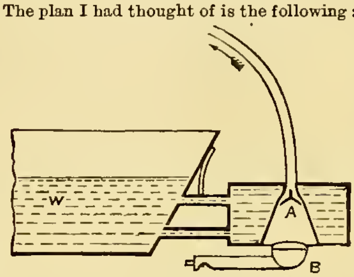
T. L. wishes to know how to keep white wax from changing its colour to yellow when melted for casting wax fruit, or moulding pure wax candles.

Fixing Gilt Cornice on Valance Board.

J. T. F. (*Brixton*) asks:—Can anyone inform me how to fix the gilt cornice on the valance-board which carries the rods supporting the curtains of the interior of bay-window of sitting room? I believe a heavy bullion fringe is nailed or tacked on edge of wood first, some I know tack the gilt moulding on, but I don't think that is correct. Have been told the moulding is slid on a proper backing of wood; perhaps some one can enlighten me as to the correct way to mount or fix it.

Rapid Heating of Bath.

Alpha asks:—Can any of the readers of your paper give me any information respecting a mode for quickly heating a bath by gas. I know of several kinds and the one most commonly used is an ordinary ring of iron pipe with several holes bored in it, but in use it is most unpleasant, and takes a long time to get the water warm. The plan I had thought of is the following:



CONTRIVANCE FOR HEATING BATH.

The boiler I intend making of copper and brazing the cone on to the bottom; the gas burner I thought the most suitable is Fletcher's solid flame of large size, a small cap of brass A, is to regulate the amount of draught and prevent too much heat passing through the tube, which conveys the products of combustion to the open air. I thought a piece of ⅛ brass sufficiently large for this purpose.

Broken Marble Slab.

J. T. F. (*Brixton*) writes:—I have a marble slab only ½ inch thick on a pedestal cupboard, corner at the front is snapped off; how can I remove, turn round, and put the damaged part at back; it appears cemented on, what will dissolve it? dare not use pressure, for fear of it breaking up.

Glass-Blowing.

C. J. M. (*Ireland*) writes:—Can any of your readers tell me what flux, if any, is used to blow two pieces of glass together, such, for instance, as the stem of a broken wine-glass?

Polishing Stones.

E. A. F. (*Cromer*) wishes for an article or information on polishing stones, agates, etc., which would be most useful, especially to seaside subscribers to Amateur Work.

Queen Anne Furniture, etc.

L. W. E. writes:—Will some fellow-subscriber be good enough to inform me where I can obtain, at a moderate price, the small railing so much used in Queen Anne and early English articles of furniture? I should also be glad if some one could give me a sketch of a monogram, formed of the initials L. W. E., suitable for fretwork.

Small Portable Forge.

T. W. (*Clapham*) wishes very much for instruction how to make a small portable forge with a fan, in lieu of bellows, to be worked by a pedal. External measurement, 3 feet high, 2 feet long, 18 inches wide.

Brass Wire Springs.

H. M. H. asks—for any information that can be given in regard to the process which brass wire must undergo to render it for making springs, spiral or otherwise, or whether a special alloy is used for the purpose.

Small Hot Air Engine.

C. T., Junr. (*Portman Square*) writes:—In the People's Café, Gracechurch Street, is a little hot air engine, working a pump and fountain in an aquarium. I myself, and I daresay, many others, would be glad to know how it is constructed; it is little more than a toy, but a very pretty and useful one.

Special Design for Small Book-Case.

Apprentice Merchant asks:—Will any kind reader please give design and instructions for making an ornamental upright case, with glass in fronts; size, 24 inches high, 18 inches wide, and 6 inches from front to back, with shelves inside for showing off small New Testaments, birthday books, etc., etc.?

Inspirometer.

Chest writes:—I shall be obliged for information how to make or where to buy an inspirometer, for measuring the capacity of the lungs by inhaling the air; also the probable cost.

Varnish for Tracing-Paper.

J. C. (*Dursley*) writes:—I have a receipt for making tracing-paper, but it does not say how the varnish is to be made, and this I wish to know. I append a copy of the receipt: "In order to prepare a beautiful transparent colourless paper, it is best to employ the varnish formed with Demerara resin, in the following way: The sheets intended for this purpose are laid flat on each other, and the varnish spread over the uppermost sheet with a brush, until the paper appears perfectly colourless, without, however, the liquid thereon being visible; the first sheet is then removed, hung up for drying, and the second treated in the same manner. After being dried, this paper is capable of being written on either with chalk or pencil, or steel pens. It preserves its colourless transparency without becoming yellow, as is frequently the case with that prepared in any other way."

Meteorological Instruments.

T. H. H. (*Ashford*) writes:—I beg to second the appeal of B. V., for papers on the above subject. What I am particularly in want of at present, is a rain-gauge, but my difficulty is, how to measure the rain-fall after it is collected, by means of a funnel representing ten square inches of surface. When making enquiries, with a view to purchase a rain-gauge, the price asked has always been such as to frighten me completely. [I shall be glad to have a paper on "The Rain-Gauge: How to Make It," and other meteorological instruments, from any person thoroughly competent to write on this subject.—Ed.]

Camping.

VOLUNTEER writes:—I shall be obliged if any veteran will give instructions for making really handy pegs, rifle-rack, table, wash-stand, etc., for small bell tent used at volunteer encampments. The articles should be suitable for a tent occupied by about six men for a week; and must be quickly and firmly fixed and unfixed, and so arranged as to be packed into a small compass for travelling

Dynamo-Electric Machine.

WILLING TO HELP writes:—I have written to Messrs. Patrick, of Chelsea, as recommended by Mr. Edwinson, for castings of machine, enclosing wrapper for catalogue, but can get no reply. Can Mr. Edwinson give me another address?

Hammocks.

H. J. (*Finsbury*) wishes for instructions in making net and canvas hammocks.

Hard Stopping for Wood.

EXON has several doors with panels split and the mouldings opened at corners; will some reader kindly inform him how to make or where to obtain a good hard stopping that will not shrink and fall out?

Wind-Power for Lathes.

W. S. (*Longside*) writes:—Being desirous of applying wind-power to a lathe, I would feel obliged if any amateur would kindly give instructions with a diagram.

Norwegian Cooking Stove.

M. V. T. writes:—I would feel much obliged if you, or one of your correspondents, would inform me how to make a "Norwegian Cooking Stove," "Nest," or "Kitchen." I have seen it so variously asked. It is a box into which the saucepan is placed, when its contents have reached the boiling point and left there till convenient to remove it, when its contents are found perfectly cooked and warm. Of course I know the box is filled with some non-conductor of heat; but what it is that is employed and the process of making, I am ignorant of. [The box is lined throughout with felt or some good non-conductor in order to retain the heat within it. As it may be useful to many to know how to make a box of this description, perhaps some reader will give a detailed account of the method of constructing it, with illustrative diagrams to appear as an article in this magazine.—ED.]

Chip-Carving.

A. B. (*Newark-on-Trent*) writes:—Could you or any of the readers of AMATEUR WORK, tell me where I can obtain patterns for chip-carving, or a handbook on the subject?

Effect of Zinc on Hot Coals.

H. B. asks:—Will any reader of AMATEUR WORK, who has tried the method of cleaning stove-pipes, described in page 91, Vol. I. of AMATEUR WORK, kindly say how he set about it, and what effect was produced?

Tools for Cutting Fancy Trays.

E. J. (*Colne*) writes:—I should be glad to know where to get suitable tools for cutting fancy trays, card-baskets, etc., from burnished cardboard.

Regilding Picture Frames.

T. S. (*Brimscombe*) asks for instructions how to remove the old gilding (if necessary) and to regild the frame.

The Zither.

E. F. (*Sheffield*) asks for instructions for making, tuning and playing the zither.

Inlay for Guitars, etc.

H. S. (*Derby*) asks:—Can you tell me what the material is which looks like mother-o'-pearl, and is used for inlaying the finger-boards of guitars and other string instruments. Can it be obtained, and, if so, where? (2). Is there any sort of "amalgam" which can be used for inlaying, and which gives the appearance of silver?

Re-Browning Gun Barrels.

C. J. M. writes:—I shall be glad to have replies to the following questions with regard to re-browning gun barrels. 1. Must the barrels be *perfectly* clean before the preparation is laid on? 2. Should the barrels be quite hot, or merely warmed before a fire? 3. Should the preparation be laid on with a brush or a piece of wool. 4. Must the preparation be left till *perfectly* dry? 5. Is it essential that the oil be *olive*, or will that which is sold as olive (viz., refined rape) do? 6. What quantity of chloride of antimony would be wanted for a pair of barrels? 7. Are there any other simple methods of re-browning?

Tool for Cutting Mouldings.

E. W. (*Headley*) writes:—I fear my query was rather vague. The tool about which I wish to get particulars, is one which will make a moulding round a slab of wood, such as a table-top, etc., either square, polygonal, circular, or elliptical, or, indeed, with any curve, and which will also make a moulding on these hard woods, which an ordinary moulding-plane will not touch. I have succeeded in making a moulding round the edge of square oak table-top, using a very finely-set moulding-plane, but for making a moulding on a circular table-top, I want a tool of a different description; I think that it is called a "scratch-tool," and that it is usually made by the workmen who use it. If any reader could tell me where I could procure a set of these I should be greatly obliged.

Firing China-Paintings.

W. A. P. asks:—Can any readers of AMATEUR WORK tell me whereabouts in Manchester I can send china-paintings to be fired?

Drilling Glass and China.

J. McE. (*Southport*) asks:—Where he may obtain the drills, or "sparks," as they call them, for drilling glass and china, and any information as to the mode of riveting broken pieces together?

French Polishing.

ANTIPODEAN writes:—In reading the various articles in your valuable paper on French polishing and finishing wood-work, I find no allusion to the treatment of the *fret* of the work. I frequently hear complaints from amateur fret-cutters in this respect, as the lengthy process of polishing is almost impossible on such small surfaces. I shall be extremely obliged for any hints as to treatment of above.

J. H. (*Dudley*) wishes to know what is meant by "spiriting off," in French polishing.

Hookah.

A. W. (*Leeds*) wishes to know how he may make a hookah.

Pipes from Potatoes.

LIGHT-KEEPER sends the following extracts from *Chambers's Journal* for January, 1883:—"According to the *Vienna Agricultural Gazette*, it has recently been discovered that meerschaum pipes of excellent quality, susceptible of the highest polish, and even more readily colourable than the genuine *spiuma di mare*, may be made of potatoes. The familar tuber, it seems, is well qualified to compete with the substance, known to commerce, as 'meerschaum clay.' Its latent virtues in this direction are developed by the following treatment: Having been carefully peeled and its 'eyes' extracted, the potato is boiled unintermittently for thirty-six hours in a mixture of sulphuric acid and water, after which it is squeezed in a press until every drop of natural, or acquired moisture, is extracted from it. The residuum of this simple process is a hard block of delicate creamy white hue, every whit as suitable for the manufacture of ornamental and artistically executed pipe-heads as the finest clay. The potato, moreover, dealt with in the manner above described, promises to prove a formidable rival to the elephant's tusk. As potatoes are plentiful all over the world, and are likely to remain so, whilst elephants are, comparatively speaking, rarities, mankind at large may be fairly congratulated upon the discovery of a substitute for ivory, which can be produced in unlimited quantities at an almost nominal cost, taking into consideration the difference of price between a pound of potatoes and a pound of elephant's tusk." He adds: I forward the preceding, as I suppose it will be interesting to many of your readers, and I hope you will inform me how much sulphuric acid, its price and postage, I am likely to require to make two or three trials. My boiler will be an old meat can, 6 inches deep and 4 inches in diameter. Must acid be mingled each time with the water added, to make up for evaporation? [Can any reader help our correspondent, whose nom-de-plume tells the story of his daily life and calling, and who shows by his contributions that he is always willing to help others!—ED.]

Canvassing of Sea-Going Yachts.

V. W. D. (*Belfast*) wishes to know if there is any work in which the above-named subject is treated.

Photographic Transparencies.

C. T., Junr. (*Portman Square*) writes:—I see in the west-end shops, photos mounted on large ground-glass panels—*i.e.*, they seem so; they are very expensive, and I have some valuable subjects I should be glad to utilize, if I knew the way.

BRIEF ANSWERS TO MINOR QUERIES.

C. F. F. (*Leeds*). The subject you mention will be treated in the series of articles, "How to make a set of Photographic Apparatus," by Mr. Parkinson.—L. W. E. (*Market Harborough*). 1. Yes, that is the invention of the author of "Printing for Amateurs." 2. Your suggestion shall receive consideration.—J. M. (*Liverpool*). Your letter is acknowledged with thanks.

—J. T. F. (*Brixton*). In matters involving medical treatment I never presume to give advice, remembering the old proverb, *Ne sutor ultra crepidam.* Your medical man will tell you all you wish to know, or a good chemist may be able to inform you of the nature of nitrate of amyl, how it is administered, etc.—TE JUDICE. 1. You can buy what is termed continuous paper, that is to say paper of any length within reason and of considerable width, of any artist's colourman. Artists use this for the preparation of cartoons on a large scale. For taking impressions of undercut work in carving use gelatine.—AURELIAN. 1. Paste the pattern on the wood. 2. Use Stephens' Stains to produce the desired tint, and then varnish or French polish. 3. Any of the tool-makers, etc., who advertise in this Magazine will supply you with the prices of the various woods sold by them for fret cutting. —C. W. (*Ivybridge*). Apply to Mr. T. J. Gulliche, *European Art Galleries, New Bond Street.*—T. F. (*Nun's Island*). The subjects that you wish to have treated have been noted and papers shall be given on them as opportunity offers.—H. M. W. (*Doncaster*). Instructions on curing skins were given in this department of the Magazine in Part XVII.—LIGHT KEEPER. I have noted your suggestions, and will act on them as far as possible.—LEX. See reply headed " Mr. Hasluck's Articles" in Part XVI. Attention shall be paid to your wishes when opportunity offers. The papers on boot and shoe making will be resumed immediately.—W. H. W. (*Sherborne*). A series of papers on Home-made Furniture will be commenced in Vol. III The couch of Austrian wood bent furniture will be specially treated in present Volume.—A. E. H. B. (*Brackley*). Fret-work patterns may be traced and multiplied to any number that you may require by the aid of blackened paper prepared for the transfer of designs. I shall be glad to receive a description of your new method with a view to its publication. — G. An article shall be given on Umbrella making and Re-covering when I can meet with any one that is really competent to write on this subject.—JACK. To your first question, Yes! To your second, No!—W. C. J. O. A Supplement giving a Design for a Music Stand and working drawings of its different parts is in preparation.—R. L. (*Featherstone Street*). Your address shall be preserved. I can find no application for assistance of the kind you offer in AMATEUR WORK, for December, 1882, and the initials you mention do not appear therein.—C. S. Junr. (*Camden Road*). I shall be happy to give publicity to your proposal, but it is not possible, at all events at present, to establish workshops and laboratories in connection with this Magazine —J. W. Procure your paint ready mixed; you can buy it in quantities from 1 pound upwards in tin cans at 6d. per pound.—W. G. Attention shall be paid to your wishes but at the same time I may say that all the articles that appear in AMATEUR WORK are strictly practical.—M. H. (*Stockton-on-Tees*). Wax fruits are made in moulds taken from the original. This subject does not come within the province of this Magazine.—L. O. L. (*Dover*). If you will say what is amiss with the ball-cock I will try to meet your wants.—J. J. R. I am glad that AMATEUR WORK has been useful to you, the testimony of a resident in any of our colonies to this effect is always pleasing to me. Griffin's patent fret saw blades are sold at 6d. per dozen for Nos. 1 to 6 inclusive, and at 8d. per dozen for Nos. 7 to 10. The price of the Improved Roger's Fret Saw Machine with blower and drilling attachment complete, is 17s. 6d. Apply to any of the dealers in tools who advertise in this Magazine. — H. S. See preceding reply. This will answer your inquiry about Griffin's fret saw blades.—T. is thanked for his statement with regard to the extra charge made for photographic apparatus.— R. E. I am sorry for your disappointment, the utmost is done to please all.—F. J. C. Your suggestions with regard to Scene Painting are good, and shall be duly acted on. —A. W. (*Leeds*). A paper on moving models is in type, but the illustration that must accompany it has yet to be engraved.—CHAT BLANC. 1. Design for Small Greenhouse appeared in Part V. 2. For flux for soldering zinc use equal parts of hydrochloric acid and rain water. 3. Possibly an application to any watch and clock-maker in the town in which you reside would obtain for you a little of the oil that is specially prepared and used for oiling clocks. 4. Wash the greasy bottles in a strong solution of common washing soda. 5. There will be some papers by a practical man on the subject you mention.—G. M. M. (*Lambeth*). 1. A paper on stretching and mounting maps and pictures will be given shortly. 2. Instructions for fixing india-rubber tyres on the wheels of tricycles have been given in " Velocipedes : Their Construction and Use, IV." page 168. If this is not what you require write again.—W. H. (*Dewsbury*). The kaleidoscope is noted for treatment, but must be deferred till the winter months.—L. M. (*Romford*). Pottery and glass manufacture are altogether beyond the province of the amateur.—C. T., Junr. (*Portman Square*). An article has appeared on the preparation of photographic slides for the magic lantern.—R. S. P. J. (*Puddletown*). At some future time articles will be given on "Making and Repairing Harness."—E. L. E. (*Dundee*). The writer of the papers on "Boots and Shoes: How to Make Them and Mend Them," has been ill for some time, hence the delay.—W. G. G. (*Woodford*). A reply has been made to your inquiry already. Perhaps it has escaped your notice. —L. G. S. (*Brixton*). Your idea is a good one, but I have no time to take it in hand and carry it out. Why not set to work yourself?—A. K. (*Soham*). Directions for making a blower for a fret machine are given in Part VII.—J. J. (*Peterhead*). An endeavour will be made to secure the continuity of papers from month to month.—J. B. C. (*Stoke-on-Trent*) is thanked for his letter. I do not wish to produce designs taken from the source mentioned.—V. W. B. (*Belfast*). Your query has been answered. I do not know of any work treating of the canvassing of sea-going yachts.—IMPATIENT. The good time is coming, try to exercise patience a little longer.—G. T. (*Plymouth*). I do not wish to have a paper on the subject you name. The supply of supplements independently of the Magazine is under consideration.—A SUBSCRIBER. Your postcard has been forwarded to the gentleman who has undertaken to write on piano-forte tuning, etc.—NEMO. You had better put your proposal in the form of an advertisement. If we inserted it without charge. we should be inundated with similar proposals. — VIBRATION. The first article on Piano-forte Tuning is in type and will appear shortly.—W. C. B. B. (*Chelmsford*). I hope that a paper on the method of making a Magic Lantern will appear towards the close of the year.—C. J. B. For my part I prefer Syer's Bench, especially when fitted with the "Instantaneous Grip Vice." It occupies little room, which is often a desideratum.—SIGMA. The Pantograph is mentioned in the paper on "Overglaze Painting on Porcelain," in this part. You ought not to find any difficulty in making a small box for cash, etc., with two compartments. For secret spring for box apply to any good ironmonger in a large town, or failing this, to Messrs. R. Melhuish & Sons, 85 *and* 87, *Fetter Lane, E. C.* — R. C. (*Aberdeen*). The promised articles on Basket-making have not been lost sight of. I hope they will appear in Vol. III. It is not possible to give them earlier owing to the number of subjects now awaiting publication or rather continuation. —H. S. (*Driffield*). A series of papers on "Woodcarving for Amateurs" is now appearing in this Magazine.—GEORGE THE FIFTH. See our articles on " Picture Frame Making," and provide yourself with a mitre box, or one of Booth's Mitre - Cutting Machines, price 15s.—W. J. McQ. (*Port-Blair, Andaman Islands*). The articles on rubber stamp making are in hand and will soon be commenced. Furthermore, a contributor has undertaken to furnish a paper on repairing English Concertinas.—J. C. (*Golcar*). Picture-Frame Making is now being treated in AMATEUR WORK. For engravings apply to George Rees, 41, 42, *and* 42, *Russell Street, Covent Garden, London, W.C.*, who may be able to supply you with what you require.—E. J. (*Cork*). Your question cannot be answered in AMATEUR WORK.—HALF JACK. An article on the subject you mention is in contemplation.—HARRY. Your wish shall be satisfied as speedily as possible.—NORTH COUNTRIE. An article on the subject you name is now in type and will appear shortly.—F. B. (*Bandon*). The articles on Rubber Stamp Making will be commenced shortly—J. H. (*Blackpool*). See the contents of the present Part, in which I have endeavoured to meet your requirements on a new and original plan.—ELECTRICITY. A series of papers are in preparation in which your want will be met.—X. Y. Z. Replies have been given to your queries.—J. M. E. (*Southport*). Your query has been answered.

Communications from the following are acknowledged:—Red Dragoon; Captain S. K.; M. J. C. (*Bradford*); J. J. (*King's Cross Road*); Dr. H. M.; W. C. S. (*Newburgh*); A. E. S. (*St. Leonards*); H. H. D. B. (*Blundellsands*); S. W. O. (*Croydon*); ANGLETON, J. P. (*Staveley*); H. and E. J. D., AMATEUR, W. H. B. (*Midlothian*).

*** Although eight extra pages of "Amateurs in Council" are given with this Part, there are nearly four more in type, which are unavoidably "crowded out."

ARTISTIC MODELLING AND AMATEUR SCULPTURE.

By MARK MALLETT.

III.—WORKING IN MARBLE—TOOLS—PROCESSES AND METHODS OF WORKING—DIFFERENT KINDS OF MARBLE—OTHER MATERIALS FOR SCULPTURE.

WORKING IN MARBLE.—The late Nathaniel Hawthorne, speaking in one of his latter works of sculpture, compares the clay model to life ; its second phase, the plaster cast, to death ; and its final reproduction in marble to a glorified resurrection. The comparison is a happy one, especially in the last particular ; for that transformation into marble, of which I am about to describe the processes, gives not only a beauty and dignity wanting in the previous materials, but also a durability almost akin to immortality.

The Parian and Pentelic marbles, whose names are so familiar to us in connection with the sculpture of classical times, are no longer available to the carver. The material most prized and most commonly used by us moderns, and which we emphatically distinguish as "statuary marble," is brought from the quarries of Carrara, which are situated in the Italian Duchy of the same name. These quarries have been famous from the times of the Roman Empire downwards, and are so extensively worked that the largest, that of Torano, employs between one and two thousand men. Than this, a more noble or beautiful material could not be desired for the sculptor's art.

Carrara marble is semi-translucent, and, in the best blocks, of a pure and brilliant whiteness. But dark grey spots and veins sometimes occur in it, which greatly interfere with its beauty and value. In any part of a bust or figure, a dark mark is objectionable ; but coming, as it sometimes may do, on an important feature, as, say, the eye or mouth, it may altogether change the expression, and ruin the effect of the work. Nor is it always easy, from the external appearance of a rough block of marble, to tell what its internal colour may be. It is possible that an ugly spot which shows on the outside may be wholly worked away in hewing out the piece of sculpture, and that a block which appears to be without markings may develop a spot just as the surface of the figure is reached. When the late J. H. Foley, the greatest British sculptor of his day, was a poor and struggling young man, he received his first commission for his well-known "Ino and Bacchus." For £100, a great sum to one in his circumstances, he bought what he believed to be a proper block of marble, and set a workman to point and rough-hew it. After some days' labour, the mason reported that, instead of being suitable to embody the nymph and infant wine-god, the marble was fit only "to make a carriage bitch and pup !" Black spots were appearing in all directions, and the unlucky young sculptor had to buy a new block.

FIG. 7.—MARBLE CHISEL.

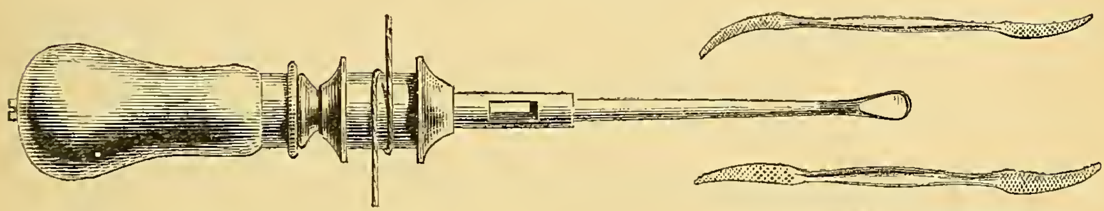


FIG. 10.—SCULPTOR'S DRILL.

FIG. 12.—SMALL MARBLE RASPS.

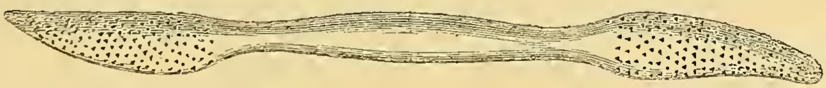


FIG. 11.—LARGE MARBLE RASP.

An experienced marble worker is, however, often able from outward marks to form a tolerably accurate estimate of the internal colour of the stone ; and the amateur will do well to leave the selection of his material to a trustworthy marble mason. As regards texture, a marble of medium hardness is best. A very hard and flinty stone is difficult to work, whilst the softest qualities are apt to crumble under the tool, and do not admit of any delicacy of finish.

Hewing the block of marble roughly into shape is an operation with which the modern sculptor rarely

has much to do. It is left to a mason; and by the aid of the pointing machine, any workman who will exercise ordinary care can do this satisfactorily.

The pointing machine is a modern invention, and was perfected by the great Sir Francis Chantrey. Over the old method of copying by the aid of plummet and compasses it gives us great advantages, in insuring accuracy and in economizing time and labour. Busy sculptors generally have pointing machines, and workmen to use them, on their own premises. The amateur will do better to imitate those of less employment, who have this work done at the shop of some reliable marble mason. Some description of the process of pointing will, however, be both necessary and interesting.

We will suppose that the piece of sculpture to be pointed is a bust. The plaster model and the block of marble are fixed side by side upon slabs of stone, and along the front of each stone are scales, graduated precisely alike; hence these stones are termed "scale-stones." The pointing machine is made to slide along an iron bar in front of either scale-stone. It consists of an upright, having a cross-arm, which can be made to slide up and down it; this arm is furnished with movable joints, which can be tightened and rendered rigid by screws. At the end of the arm, a needle plays backwards and forwards through a socket.

The operator first marks a point upon the model with a pencil, say, for instance, at the end of the nose. He then so arranges his machine that the needle will just touch this point, and screws every joint tightly. He observes the exact place occupied by the foot of the machine on the graduated scale, and then removes it to the corresponding place on the scale beneath the marble. As every joint is tightly screwed up and immovable, the needle will of course point to a spot in the marble exactly corresponding to that marked in the plaster model; and by drilling a hole till the needle will penetrate to exactly the same depth as before, he finds this spot; having done so, he marks it with his pencil.

The required point being thus established with absolute precision, it is a simple matter to chip away the mass of superfluous marble which projects beyond it; which is chiefly done with "picks," that is, with chisels not edged but pointed. These fetch off the material in large flakes, and are less liable to bruise the marble beneath, than flat chisels. In a like manner, a succession of points may be taken, till the whole surfaces of model and marble are dotted over at intervals with pencil marks; for the movable joints in the machine will permit points to be taken in every portion and on every side of our bust. In the hands of a careful workman, it is almost needless to say, the points on the two surfaces should correspond with mathematical precision.

It is the pointer's business to hew down the marble to within $\frac{1}{4}$ inch or $\frac{1}{8}$ inch of the required surface. The bust as he leaves it looks something like a person who has had the small-pox, it being covered with little round holes, the bottom of each of which is darkened by a dot of blacklead. Our bust is now ready for the more artistic labours of the carver.

The block of marble will have to be firmly fixed with plaster on a strong turn-table stand, of a convenient height. This will be one which will bring the head of the bust *nearly* as high as that of the carver, when standing. The model must be set beside the marble on a stand which will bring it to the same height. This also must have a turn-table, that both model and marble may be moved freely as occasion may require.

The chief and typical tool of the sculptor is ever held to be the chisel. In Fig. 7 I give an example of a marble-chisel of medium size. This instrument has a cup-shaped head—that is, its head is hollowed, and presents only a narrow ring of metal to the hammer, instead of the broad, flat surface offered by the tool used for carving soft stone; this is that the hammer may have a firmer grasp, and be less liable to slip whilst forcing it through the more dense material. The beginner should have not less than ten or a dozen of these tools, varying in width from $\frac{1}{8}$ inch to $\frac{3}{4}$ inch. They will cost from 6d. to 8d. each. Chisels from $\frac{1}{4}$ inch to $\frac{1}{2}$ inch wide are the sizes most generally useful; and some of these will be rendered more safe and serviceable by grinding or rubbing the corners to a round shape.

The most necessary caution to be given to the beginner in the use of the chisel is, that he should not hold it at anything approaching to a right-angle to his work, but keep it slanting. If held and struck too nearly to a right-angle, there is danger that the marble beneath will be what is technically termed "stunned"—that is, it will be bruised, and will have a dull and chalky appearance, or perhaps crumble away under the final operation of sanding.

In contact with so hard a substance as marble the tools soon become dulled, and must often be rubbed up to an edge again. This is generally done with water on a flat piece of Yorkshire paving-stone, which has a sharp grit; a finish can afterwards be given on an ordinary oil-stone. A scrap of Yorkshire stone sufficient for the purpose—say a foot in length and half that in width—may be had almost for asking at a stone-yard.

Under the frequent rubbings to which they are subjected, tools soon wear, and require to be freshly drawn out. Most blacksmiths understand how to do

this, though some do it far better than others. When banding the tools to a smith, to be put in order, it is well to instruct him as to the nature and hardness of the stone on which they are to be used, that he may temper them accordingly. The uniform charge for drawing out and tempering is one halfpenny per tool. The fact that tools soon get out of order, and require to be put right again, causes a larger stock to be necessary to the sculptor than would otherwise be demanded.

In Fig. 8 is shown the sculptor's hammer, which is used for driving these chisels. It has a short haft, a head of solid steel, and should weigh from 2 to $2\frac{1}{2}$ lbs. It costs about 3s. 6d. This is generally used ; but in representing some substances, and notably the hair, a dummy of soft metal is preferred. The dummy (Fig. 9) is sometimes made of lead, sometimes of zinc ; but a common cause of complaint among carvers is that the first metal is slightly too soft, the second slightly too hard. A carver of much skill once confided to me. as a valuable secret, that he had discovered the happy mean—that the density of pewter was just intermediate. I had a pewter dummy made, and found it succeed so well that I have never since been without one. Of the benefits of his discovery and my experience I make a present to the reader. The weight of the dummy should be much the same as that of the bammer.

If, as will probably be the case, the amateur has previously made some essays in carving in wood or stone, and, of course, without the help of pointing, he will now be able fully to appreciate the value of that invention. It is not only the rough workman, who removes the mass of superfluous material, who profits by it. Its use is scarcely less great to the artistic carver, and especially during the earlier stages of his work. By it he is freed from all necessity of troubling himself about general form and proportions. For these he can rely on the accuracy of the machine, and he needs only to look to such variations of form as lie between point and point ; and these points, in the more intricate parts, will probably be but the fraction of an inch distant from each otber. His labour is thus simplified and facilitated in a wonderful manner.

But as be comes down more nearly to the required surface, he will have to grow less trustful of the accuracy of his points. An error, though it may be but of the hundredth part of an inch, is of importance in a delicate work of art, and the best workmen will not avoid all errors. Some testing by occasional measurements will now become necessary. A common fault of the pointer consists in drilling some of his holes too deep. This must be borne in mind, and due allowance made when necessary.

Next in importance to the chisel is that exceedingly useful tool, the drill (Fig. 10). Whenever any decided hole has to be sunk, as within the ears, the nostrils, in undercuttings of the drapery, between the locks of hair, in the corners of the eyes even, this most safe and handy tool comes into play. It is fitted with bits of various sizes, which, like the chisels, will at times require to be placed in the hands of the blacksmith. Such a drill as that shown (about 16 inches long), with half-a-dozen bits, and fiddlestick for turning it, costs at Buck's, *Tottenham Court Road*, 27s. This shop, I may here remark, is an excellent one for all kinds of marble tools. Many of the things may certainly be bought cheaper from the Birmingham or Sheffield tool makers ; but I know of no other shop in which one finds so good an assortment from which to choose.

The hair is best expressed by indicating its flow by clean strokes of the chisel—longer or shorter as it is flowing or crisp in character. In making these strokes, the chisel is best driven with the dummy, and a somewhat rounded chisel will work best. Firm and decided handling is necessary in this, especially if the hair be inclining to straight. These chisel strokes, when once satisfactorily made, are not afterwards to be touched with rasp or sand-paper.

Not so the other parts of the work. In most portions it is not the practice to carve down absolutely to the surface with the chisel. Danger of stunning is avoided, and a more brilliant surface secured, by removing the last film of needless material and moulding the actual face of the work with the rasp.

Sculptor's rasps are made in a great variety of sizes and shapes, so as to be adapted to every variety of surface. In price they vary from 6d. to some shillings each. Fig. 11 shows a most useful rasp for large surfaces. It is about a foot long, and costs 3s. 6d. Fig. 12 shows two smaller rasps of useful forms, drawn to the same scale. These would cost 10d. or 1s. each. With the rasp, held in a firm hand, the marble may be worn down, and moulded into shape at pleasure. It is, in fact, far easier to reduce and alter the surface of marble by this means than to make similar alterations in either clay or plaster. About three or four rasps of useful forms and sizes are sufficient for a beginner.

The roughness and scratches left by the rasp may be removed by using medium and fine glass-paper.

The final operation is that of sanding. Fine, clean, sharp sand is wetted ; into this the sculptor dips the end of a stick, and taking up a little of the sand applies it to the marble. He gives the stick a kind of circular motion, working it round and round, thoroughly rubbing and grinding with it the surface of his work. By this means the dull and scratched appear-

ance which the latter has previously shown disappears, and the natural brilliancy of the marble is brought out. The pieces of wood used in sanding should be of a soft and even grain. Pine is best ; common deal, with its ribs of hard grain, is unsuitable, and would be liable to injure the surface. These sticks may be as thick as a finger, more or less, according to the nature of the work, and four or five inches long ; their ends should be roughly rounded in the first instance, but not much care is necessary in this respect, as they will soon wear into a shape adapted to whatever surface they may be used upon ; and, indeed, they will not be long in wearing away altogether.

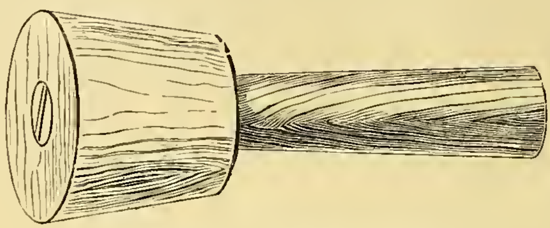


FIG. 9.—DUMMY FOR CARVING HAIR, ETC.

In the hair, and in some kinds of drapery, the comparatively dead surface left by the chisel is generally preferred ; though to keep these parts from forming too strong a contrast with the flesh, some persons rub them lightly over with a hard brush and a little wet sand.

Those parts which are regularly sanded often want going over with the stick two or three times ; and frequently after the sand has been washed off, and the marble become dry, scratches and marks will again show themselves, which will demand a local repetition of the process.

When, by this operation, the work of the sculptor, properly speaking, is finished, some small natural cracks or holes will, perhaps, be visible, as well as point-holes which have been drilled a trifle too deep. These will have to be stopped. Melted borax makes a good and enduring stopping, but is rather difficult of application ; spermaceti wax will generally answer the purpose sufficiently, and may easily be forced in cold with the point of a knife.

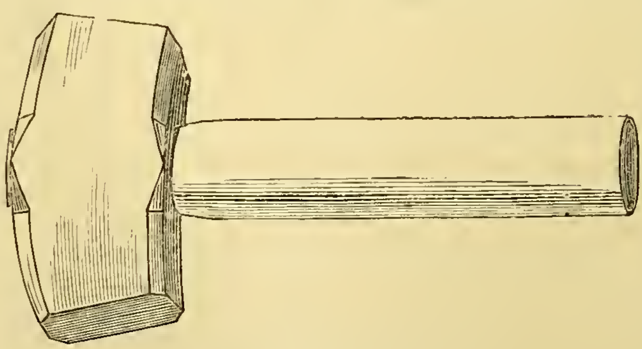


FIG. 8.—SCULPTOR'S HAMMER.

If the bust is a terminal one, it is now finished. If not, it will need to be fixed with a copper bolt and plaster on a suitable turned pedestal. This is commonly left to the marble mason, whose charge for finding marble, making, and fixing will be about £1 4s.

Charges for providing marble and pointing a life-sized bust in statuary, including hollowing out the back, will probably range from £10 to £15 ; for a medallion, according to size, from £1 5s. to £3 10. These figures will serve to give the amateur some idea of what he may have to pay, but they are not, and cannot be, very exact ; for in two busts, both of which are life-sized, one may cut into almost twice as much marble, and involve more than twice as much labour, as the other.

Hard as is Carrara marble, compared with many kinds of stone, it does not bear exposure to the weather in this climate. For out-door sculpture Sicilian has to be employed in its place. Sicilian marble is much harder and more compact in grain than statuary : instead of the beautiful whiteness of the latter, it has a cold, grey tinge, and is commonly marked with dark veins and spots. By careful selection, however, it is possible to get a piece sufficient for a medallion, or even for a bust, free from these markings. Its hardness renders it trying to the temper of tools, but, being less liable to crumble than statuary, it can be worked much more boldly with the chisel. For this reason some sculptors profess to like carving Sicilian better than the softer material. Its price, as compared with statuary, is small, and, unlike the latter, it is to be obtained readily in blocks of any size that may be wished. Large blocks from the Carrara quarries are of limited supply, and high in price.

Bronze.—Whilst dealing with materials for out-door sculpture, it will not do altogether to omit bronze, though there are not many amateurs who are likely to engage in so formidable an undertaking as the making of a bronze statue. Of all outdoor materials, bronze undoubtedly stands best, but in modelling for bronze some special points have to be observed. Its dark colour causes any elaboration of detail to pass unobserved. It is upon a good and telling outline that the effect will mainly depend, and towards securing this the chief attention of the modeller will have to be directed.

In these days the sculptor does not, as he did in those of Benvenuto Cellini, find it necessary to be a

master of the founder's craft as well as his own. He now places his plaster model in the hands of a professed founder, and such is the skill of our modern craftsmen, that he need have no fears as to the result. If our amateur has any intention of executing a work in bronze, he can learn full particulars as to casting and its cost, by applying to Messrs. Drew and Co., of *Thames Ditton.*

What an amateur is more likely to desire reproduced in metal will be some small matter, such as a medallion, and for this electrotyping is the preferable process. This process many of my readers will be able to carry out for themselves, and information with regard to it will be found in another part of AMATEUR WORK; or it may be done at professed electrotyping houses, such as the well-known one of Messrs. Elkington and Co.

Terra-cotta.—Rendering the clay itself permanent by burning—that is, by converting it into what is commonly known as terra-cotta—is a modern revival of a practice common both in classical and renaissance times. During the last few years it has become fashionable even for portraits, and if less suited for embodying works of absolute beauty than marble, it is an admirable vehicle for the display of force and vigour in modelling. A somewhat sketchy treatment seems best adapted for terra-cotta; in this material any elaborate finish only results in tameness. It demands a free and masterly handling of the clay, and is therefore little suited to the beginner in modelling.

The appliances for successfully burning, or, as it is technically called, "firing," a work in terra-cotta, can scarcely be provided by the amateur on his own premises, though some few sculptors have done so. There are many places in London and in the provinces where this firing can be done at a moderate charge. In London the modeller can insure a successful result by placing his work in the hands of Mr. N. F. Lucchese, 75, *Euston Street*, *Euston Square.* It is to be remembered that a model intended to be fired must have in it no supports of metal, wood, or any other foreign substance, or it will crack. Terra-cotta reproductions from the plaster model can be procured by placing the cast in the hands of such firms as the Watcombe Terra-cotta Company, *St. Mary Church*, *Torquay;* or the Torquay Terra-cotta Company, *Torquay.*

Methods of Treating and Preserving Works in Plaster.—Under the above heads I have spoken of the more important of the materials in which it is usual to give permanency to sculpture. But before I close this article I may perhaps render a service to the amateur sculptor, by giving some hints on the treatment of plaster casts, intended to be preserved as such.

To keep plaster in that state of brilliancy in which it leaves the mould is no easy matter. The most effectual way, when it is a work that can be so treated, is to place it under glass, and by making the case air-tight, rigorously to exclude all dust. When a work in simple plaster has once become soiled, there is no way of so cleaning it as to restore its original purity. The best plan to remove dust, is to sprinkle a little fine, dry plaster over it, and to work this plaster about with a dry, soft brush. The dry plaster will take up and remove dust, but not stains.

Instead of the chalky look of the natural plaster, a more soft and glossy one may be given by saturating the cast with various substances. Plunging it in skim milk, in paraffin, or in melted wax, will do this; but to do it successfully requires some skill and care. Another method, which may be adopted with medallions or statuettes, is gilding or bronzing. This, when well done, renders them indistinguishable from actual metal. If placed in the hands of Mr. S. Gushlow, 60, *Newman Street*, *Oxford Street*, the amateur can have his works treated by these processes to perfection.

It will, however, be desirable that he should know how to gild or bronze a cast himself, though he cannot in his first attempts expect to make his work all that could be desired.

To gild on plaster, first render the cast non-absorbent by saturating it with linseed oil. Two or three coatings should be given, at intervals of a few hours; after which the cast must have a day or two (according to weather) to dry. It should then be smoothly painted over with ordinary size in which yellow ochre has been finely ground. This must be thoroughly dried. It is now ready for the coat of japanners' or of oil gold-size, on which the gold leaf is to be laid in the ordinary way with the "tip," so soon as it is so far dried as to be merely "tacky"—that is, slightly sticky. The former size will be fit to work on much more quickly than the latter, but will not be so strong.

Some persons gild with even less labour, by simply coating the cast (after it has been rendered non-absorbent) with the gold-size sold in the form of a paste by colourmen. This is, I believe, composed wholly or chiefly of boiled oil and yellow ochre, and for use must be thinned with boiled oil. This will require twenty-four hours, more or less, according to weather and circumstances, to dry to the proper state of tackiness; and will then receive the gold leaf without any further preparation. When dry the gilding should be rubbed over with a ball of cotton wool to remove superfluous gold.

For bronzing, the following is a simple method. Having first rendered the cast non-absorbent, as directed above, coat it over with a paint composed

of the following ingredients, ground in oil, and varied in proportions to taste:—Prussian blue, verditer, and spruce ochre. When this coating is nearly dry, bronze powder has to be dusted on by means of a ball of cotton wool.

A second method is more complex, but, if well done, produces finer results. A soap has to be prepared by boiling together caustic ley of soda and linseed oil, to which must be added a saturated solution of common salt. This mixture has to be boiled till it assumes a granular appearance, when it must be carefully strained through a linen cloth, and afterwards diluted with boiling water. Four parts of sulphate of copper have now to be taken, and one part of sulphate of iron, dissolved separately in boiling water, and then mixed together. This mixture has to be poured slowly into the diluted soap, so long as any precipitate is caused. The copper and iron give to the soap—the first a metallic green, the second a metallic brown, which united produce the colour of bronze. The fluid portion has now to be poured away, and the precipitate, to which more of the copper and iron solutions must be added, is to be boiled in a copper pan. After allowing it an hour in which to settle, the liquid part has to be poured off, and the sediment—the bronzing matter—well washed with warm water. It has lastly to be washed with cold water, placed in a linen bag for all moisture to drain away, and then gradually dried. The method of using the bronzing matter is as follows:—In twelve ounces of best linseed oil boil twelve ounces of litharge, finely powdered; strain through a coarse canvas bag, and allow to stand in a warm place till the mixture becomes clear; then add to fifteen ounces of the mixture, twelve ounces of the bronzing matter and five of fine whiting. Melt these in a porcelain vessel set in hot water; a gentle heat only is required, but the vessel should remain some time in the hot water, that any moisture the mixture may contain may be evaporated. The cast to be bronzed must be heated to 200° Fahr., and the melted mixture then laid on with a brush. It must be kept hot till finished, or the bronzing will not be smooth. Small things may be bronzed by dipping them in the compound. After a few days the surface should be rubbed with a soft ball of cotton wool. A more showy appearance may be given to casts thus treated by touching up with shell gold or metallic powder. The unpleasant smell caused by this method of bronzing will go off if the work is exposed in an airy situation for a few days.

Large models, such as statues and busts, are usually painted. The plaster should first be gone over with linseed oil, to check absorption, and then painted with best white-lead paint, mixed with a large proportion of turpentine. A very thin coat only should be applied, and rather stippled than laid on in the usual method of painting; a second brush being used to remove any superfluity of paint. Some persons object to a glaring white, and tone down the colour by grinding a mere suspicion of ochre in their paint.

From plaster thus treated dust can be removed with a feather brush, and when, in course of time, the surface becomes soiled, a second thin film of paint can be applied. No second oiling will be necessary. No attempt should ever be made to wash a plaster model.

Cleaning Marble.—Marble, on the contrary, bears washing well. When it becomes soiled, a good receipt to clean it is the following:—Mix whiting and water to a paste, and stir in a little caustic potash. This should be painted over the marble, and quickly washed off again, and it will bring the dirt with it. If allowed to remain too long, it will corrode the surface.

HOW TO MAKE A SET OF PHOTOGRAPHIC APPARATUS.

By JAMES PARKINSON.

III.—SLIDING FRONT—SIDE FLAP—BELLOWS, ETC.

IN my last article on Photographic Apparatus there were two or three printer's errors, but only the following need correcting, as the others are unimportant:—In page 66, the second line, which now reads "$\frac{3}{4}$ inch wide, $\frac{1}{2}$ inch deep, $\frac{7}{8}$ inch from each end;" should read "$\frac{3}{4}$ inch wide, $\frac{1}{8}$ inch deep, $\frac{7}{8}$ inch from each end."

Fig. 16 represents the sliding front, adapted for taking stereo pictures.

Perhaps a description of the method of setting the camera in working order for stereo work will give the reader and amateur wood-worker a better idea of the use of the various parts illustrated.

The sliding front with the two apertures (Fig. 16) is placed in position in the grooves of the horizontal slide, and clamped by the small thumb-screw which runs through the slot above the two apertures and screws into the vertical front; then screw the two lenses in their flanges, and focus. The diaphragm (Fig. 30) fits inside the bellows of the camera, and is kept in its place by the elastic band running through the holes at each end. The use of this diaphragm is to separate the rays of light from each lens. The construction of Fig. 30 will be treated later on in the article. If the focus of the camera is shortened or lengthened as desired, the elastic allows the diaphragm to unfold or fold, so that it is always in its place. The stereo front is made exactly as the front for single pictures, see Fig. 13, page 65.

I cannot possibly lay too great a stress on this one important point, viz., that the wood for the sliding parts should be thoroughly well seasoned and perfectly sound in every way, otherwise in course of time you will be sadly disappointed in seeing you have spent your time and money in vain, as they are sure to warp ; and if so, the stray light is sure to cause that dreadful enemy, fog.

Tbose parts wbere the thumb-screw works would be very mucb improved by tbe addition of a thin brass plate letting in, so that the screw will bave a very firm body to screw against ; of course this is not absolutely necessary, but would add much to the finished beauty of the camera, if let in very neatly.

Fig. 17 is the side flap, which is made out of $\frac{3}{8}$ inch wood of the following dimensions :—the centre piece, $5\frac{3}{4}$ inches wide by $5\frac{1}{8}$ high ; top piece, $5\frac{3}{4}$ inches by $\frac{3}{4}$ incb ; bottom piece, $9\frac{1}{4}$ by $1\frac{1}{4}$ inches. The grain of the centre piece should run in a vertical direction, and the parts must be tõngued and grooved together. After it is perfectly set, shape, as shown in the illustration, round the corners with the small spokeshave, then bevel the edges, in order to give it a nice appearance (the bottom edge must not be bevelled) ; then saw in two where the vertical line cuts ; bevel the back edges, and binge with three brass hinges; the hinges are the same make as those used for the shutters of tbe dark slides. Tbe use of tbe side flap will be seen on reference to the isometrical view (Fig. 20). The flap is screwed to the front of the camera with four brass screws, but there must be a thin strip of wood, say $\frac{5}{8}$ inch wide and $\frac{1}{8}$ incb tbick, and the full length of the side flap and camera. If the flap was screwed on without this strip, tbere would be no room for the brass fittings to pass up and down between the camera and side flap. On reference to the isometrical view, you will see this space ; the brass arm at the end of the bottom clamp fits into another small brass plate, whicb is screwed into the end of the base-board, and keeps tbe base-board and side flap perfectly rigid wben in use. The screw plate in the centre of the flap is for the purpose of screwing the camera down to the tripod, for taking vertical pictures. This plate should be let in flush witb the wood.

Fig. 19 shows the grooves which the dark slides run in ; the dimensions of the top and bottom pieces are $8\frac{3}{4}$ by $\frac{5}{8}$ inches by $\frac{5}{16}$ inch thick, tbe side piece, which is simply a plain piece of wood, without any rebates (see section). After the wood is dressed and rebated, bore the holes for screws, and glue and screw down, keeping your dark slide in the grooves, so that you will get them in their proper positions.

In countersinking the holes for screws, be careful you do not go too deep, or when polished they will look very bad indeed, as the polish would be thickly coated on those parts. There should always be a very small portion of the head above the level of the wood, and then carefully filed down with a very fine file ; also, if possible, keep the scores of all the screws running in the same direction. A little attention in these points tends very much to improve and beautify your work ; also do not be afraid of using your brass screws—the more the better, as there is nothing gives such contrast and finish as screws and brass fittings.

Fig. 18 represents the focussing screen, which is of the following dimensions :—$8\frac{1}{4}$ by $5\frac{9}{16}$ inches by $\frac{5}{16}$ inch, and when finished should swing easily on its hinges and fall on the top of the grooves (see end view, Fig. 18).

Now we have come to the most important part of our camera. If the ground glass of the focussing screen and the prepared plate do not occupy exactly the same position and focus, it will be impossible for the resulting pictures to be sharp, so therefore you must pay great attention to this part. Take the marking gauge, and gauge the exact distance the rebate on which the plate rests in the dark slide, and mark that distance on the wood for the focussing screen ; then make the rebate, which should be about $\frac{1}{4}$ inch wide and $\frac{1}{8}$ inch deep, so that the ground glass will have a good firm bed to lie upon ; then mitre, glue, and key at all corners, and when set scrape all glue that may adbere, and hinge with two brass hinges, as shown in the isometrical view.

The screen is held in position when focussing by a small brass stud, and the focussing or ground glass by three of the same studs. Of course all the screws used for screwing on fittings must be brass.

Inside the back frame or swing-back there is a frame of wood, which should fit very nicely all round. The aperture of this should be the same as that of the focussing screen ; this is for the purpose of securing one end of the bellows to, and should be about $\frac{3}{16}$ in. in thickness, which should be mitred and keyed at the corners, and then firmly screwed from the outside of the back frame by eight screws, two on each side, and two top and bottom (see Fig. 20).

If any little difficulty should arise as to the use or method of setting up any of the separate parts, I am sure that on reference to the two isometrical views shown in Figs. 15 and 20, these will fully explain the difficulty, be it what it may. These views have been drawn in isometric perspective, so as to ensure equality of measure in every part.

Now, we have completed all the woodwork, our attention must next be given to the bellows and the different methods that may be followed in their construction, of which I describe two.

The Bellows.—The following is rather a round-

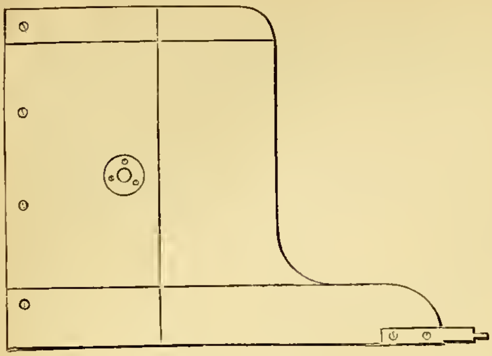
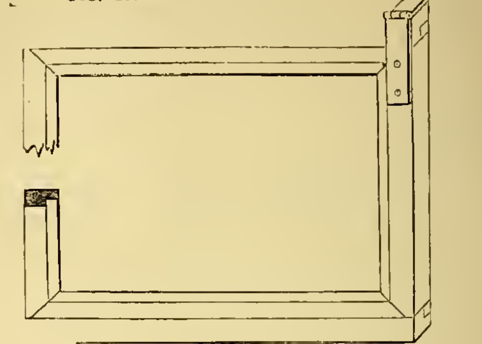


FIG. 17.—SIDE FLAP.

FIG. 18.—FOCUSSING SCREEN.



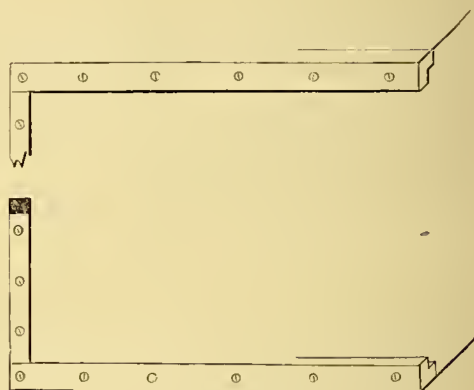


FIG. 19.—GROOVES IN WHICH THE DARK SLIDES RUN.

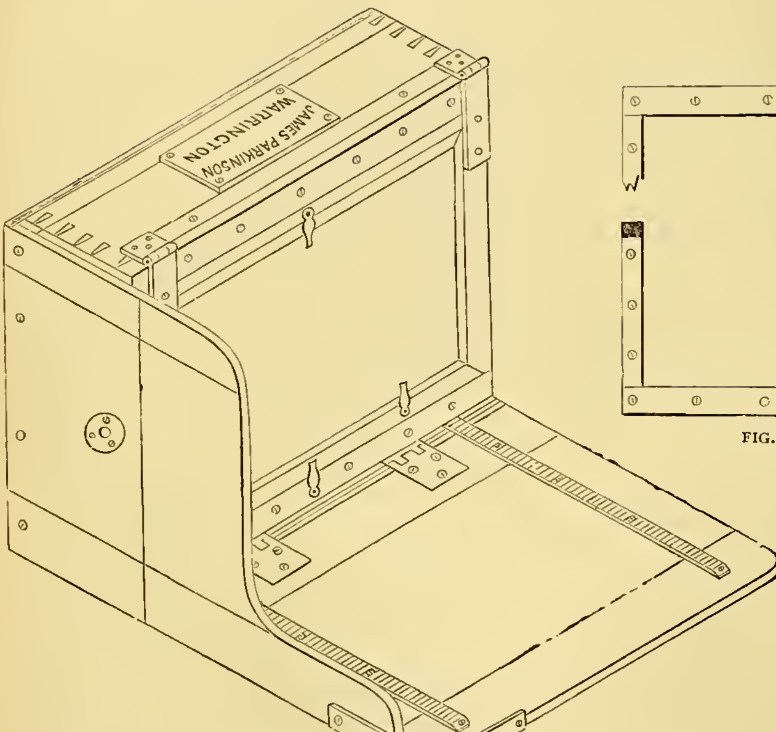


FIG. 20.—ISOMETRICAL VIEW OF CAMERA, SHOWING USE OF SIDE FLAP.

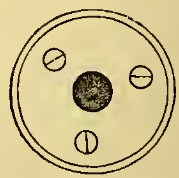


FIG. 29.—FEMALE SCREW TO RECEIVE CLAMPING SCREW.

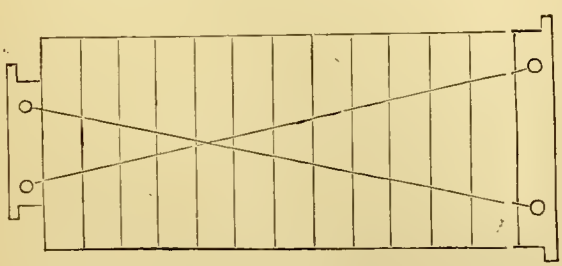


FIG. 30.—DIAPHRAGM INSIDE BELLOWS OF CAMERA, USED FOR STEREO PURPOSES.

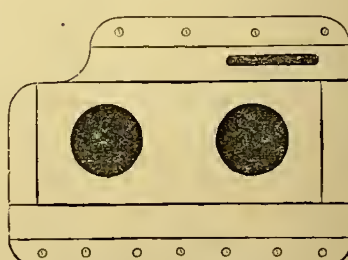


FIG. 16.—SLIDING FRONT.

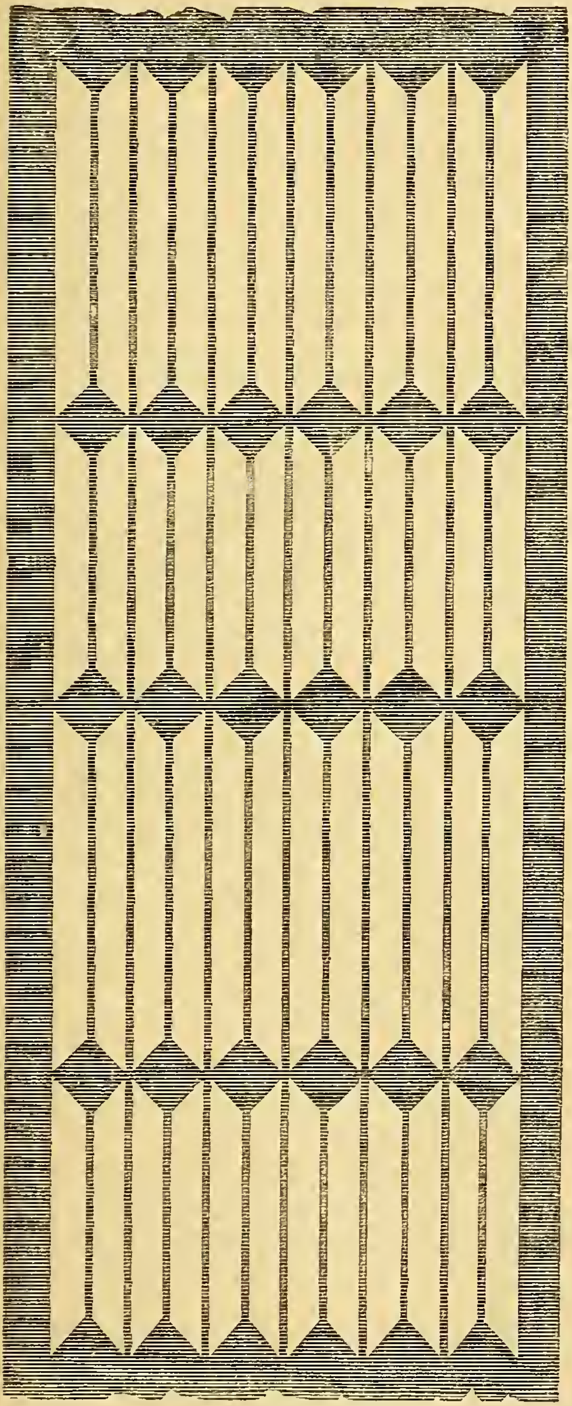


FIG. 21.—DIAGRAM SHOWING CONSTRUCTION OF BELLOWS.

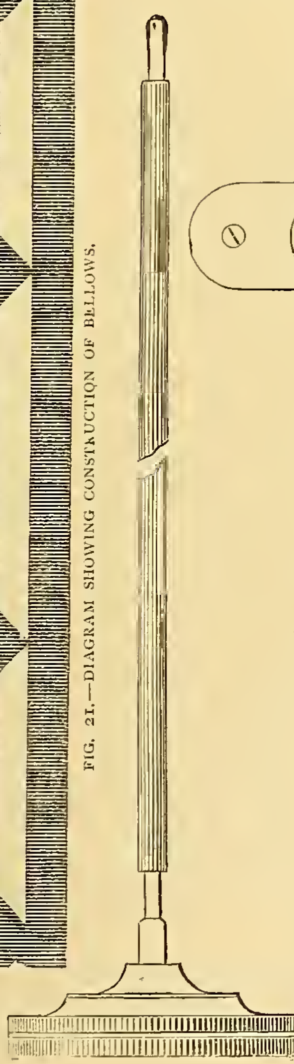


FIG. 22.—PINION FOR RACK.

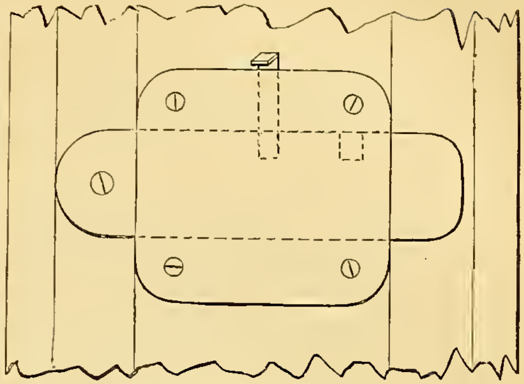


FIG. 23.—SWING BACK AND FITTINGS.

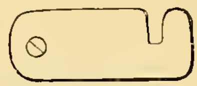


FIG. 24.—SLIP TO HOLD SIDE FLAP.

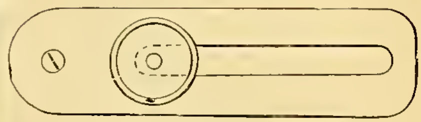


FIG. 25.—PLATE OF SIDE FLAP SECURED BY SCREW.

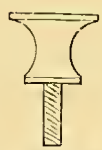


FIG. 26.—BRASS THUMB-SCREW.

FIG. 27.—BRASS BUTTON.

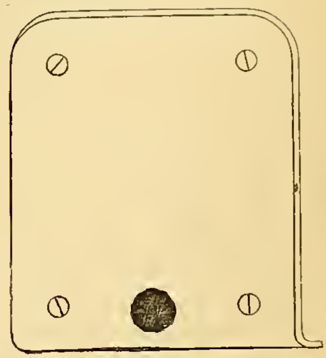


FIG. 28.
PLATE OF SHEET BRASS.

about method, but is well worthy of place in my arricle, as it is impossible to make any error if the instructions are fully carried out. It is taken from an old photographic almanac I came across the other day, so therefore I do not claim any originality for it. I shall also describe the method I adopt myself (see Fig. 21).

For the camera as described you will require a deal box of the following dimensions—$7\frac{1}{2}$ by $5\frac{7}{8}$ by 12 inches. One end must be quite even and square, but the other need not have that exactness. One of the four sides of the box must be made of three pieces grooved together, the centre piece drawing out, so that the adjoining sides may collapse a little, and so enable you to draw off the bellows when finished; for without this contrivance it would be difficult to get off if a great length.

Two back pieces must be fixed on the sliding piece, and when in its proper position screwed to the other pieces, so as to be as firm as if one piece; no ends need be put on the box, but two pieces may be placed diagonally, so as to keep the thing square and rigid.

Having got your box made, proceed to cover it with black twilled calico, letting the ends overlap one inch and a half, and paste them together with strong flour paste, which must be boiled and very smooth. Have now ready a sufficient number of pieces of three-sheet cardboard cut to $\frac{5}{8}$ inch wide and $\frac{1}{8}$ inch shorter than the width of the sides of the box. Cut the angles off a little more acute than 45°, so that when the bellows is closed up the angles clear each other. Commence now with the pasting one of the above pieces to form the folds of the bellows, having the squared end of the box towards you, lay on the first piece with the angle cut off towards you, the second piece lay on $\frac{1}{8}$ inch distant from the first, and the third, and succeeding pieces, at a similar distance, so that when the bellows is completed they will fall into their proper folds with ease and exactness.

After the pieces are laid on one side to the extent you wish the bellows to be, proceed in like manner with the other three sides, being particular as you go on to keep the pieces parallel with the squared end of the box; for this purpose have by you a carpenter's rule, so as to measure the distance, and see that both ends progress alike; also paste both sides of your strips of cardboard, so that they lie flat on the box. After all sides are covered, paste on the outer cover of black twilled calico, and dab down well, so that no wrinkles occur.

In ten to twelve hours the screws can be unloosed from the sliding piece in the side, and after being drawn out, the two adjoining sides can be drawn inwards, and the whole bellows removed from the box without any trouble.

Nothing remains now but to fold up the bellows properly (being particular to have the corners put right) and lay on a flat board, with a heavy book, or weight on the top; the bellows will then be ready to introduce in the camera.

The second method may be described as follows (for illustration see Fig. 21). The cardboard is of exactly the same thickness as used in the first method; cut a sufficient number of strips to make a bellows about 12 inches long, and for a camera as described they should be, top and bottom strips $7\frac{3}{8}$ inches, side pieces $5\frac{7}{8}$ inch. Stretch the black twill upon a level board or table, and secure with drawing pins. On reference to the illustration you will readily see the mode of placing the strips, which should be placed $\frac{1}{8}$ inch apart. Commence with the long strips first; these strips should only be glued half way, leave the left hand half unglued, if they were glued the entire length you would have a double thickness of calico at the corners, which would be very objectionable, as they would fold very badly after the first row is complete. Commence with the second, taking great care to keep every strip perfectly parallel—if you do not pay particular attention to this your time and money will be spent in vain —and after the third and fourth row are glued on the calico, let it remain for about half-an-hour, then take the pins out, and cut the calico where the first row of strips have not been glued; then cut the calico square at the other end, leaving about $4\frac{1}{2}$ or 5 inches of calico to lap over the first row; when the two ends are jointed each strip of the first and fourth rows should be perfectly parallel to each other, otherwise the bellows when folded will be out of truth and square, and would fit very badly. The calico on which the strips are glued is to form the covering for the inside, so of course the strips must be on the outside when the ends are jointed.

Now measure the calico, and cut for the outside covering, leaving sufficient length to lap over about one inch. Of course the joint must not be made on the same strips that the inside pieces are on, or you would have four thicknesses of calico.

If desired—and certainly I very strongly recommend it—the outside covering may be of leather instead of calico. The leather can be purchased of the right thickness at most bookbinders' shops, and will cost from 2s. to 3s., according to the size and quality of the skin.

All that remains, after the outer covering is dry, is to fold the bellows; taking great care to fold the corners very neatly. The bellows should not be secured to the camera till after polishing. All that now remains to be done to our camera is to fit each part in its proper place, and affix the brass fittings.

Stereo diaphragm.—Fig. 30 is the diaphragm used

for stereo purposes. It is made similar to the bellows, with calico and cardboard; but the strips are not cut at angles. At each end there is a piece of wood, sbaped as shown in the illustration, which fits into slots in the front frame and back frame. There is also a piece of elastic running through the holes, as shown; this draws the diaphragm up when the focus of the camera is shortened, and allows the diaphragm to draw out as the camera is lengthened. The use of the diaphragm is to separate the rays of light coming from the lenses.

Brass fittings.—The tools required for the manufacture of the fittings are very few and inexpensive, and are as follows :—

Pair of cutting shears; cross-cut file; small hand file; punch; 1 drill, $\frac{1}{8}$ by $\frac{3}{16}$ths; a few sheets of fine emery paper; rat-tail file.

Fig. 22 is the pinion, which is a rod of iron fluted out to correspond with the teeth of tbe brass racks, which will be seen in the isometrical view (Fig. 20). The pinion is turned by a thumb-wheel, which is turned out of brass. There are two small brass steps (not shown), in which tbe pinion works. These steps are secured to the bottom of the camera, and keep the pinion in its proper position.

The racks are generally made of brass, and should contain about 22 teeth to the inch.

They will want cutting or filing in two, so as to allow the base-board to fold; then round the underside of both pieces, taking great care not to make the tooth at tbe end too weak, or there would be a danger of it giving way. Then drill four holes in the long pieces, and two in the short one, and countersink, so that the head of the screw will leave full play for the pinion to pass over. Countersink with the large drill. Then screw down; taking particular care that the distance of the teeth at the joint, or hinged part of the base-board is the same distance as the rest. The teeth should be left well above the surface, so that the pinion may have a firm grip.

Now make a groove in the bottom of the centre frame of the camera, just so that the pinion will turn round freely. Do not groove out any more than is really necessary, or the body will be liable to lose its firmness. Then insert the brass steps for the pinion to run in from the inside of the camera, and when the proper depth is arrived at—which will be found by placing the body on the base-board, with the pinion fastened down—they may be screwed down.

Now you will require two plates, which should be cut out of sheet brass (gauge No. 19), same size as Fig. 28 (all the fittings are drawn full size). One of these plates contains a hole for the pinion wheel to fit in, as will be seen in the illustration. Mark the size for this plate, 2 inches by $1\frac{1}{2}$ inches; then cut with the shears, straighten, and make perfectly flat with your hammer. Do not knock it too hard, or it will file up badly.

On referring to the illustration you will notice there is a small part of the bottom turned up square; this part runs in the groove in the side of the base-board, and thus secures the body firmly to the base-board. Mark a line across about $\frac{3}{16}$ inch from the bottom, then place the plate in the vice, or on a hard substance, and knock this part at right angles, then file up with the cross-cut file, and bore the holes with the $\frac{1}{8}$ inch drill, and countersink with the large drill. If desired, the fittings may be screwed on with round-headed screws, and, in my opinion, are very much improved; in this case they would not require countersinking. Then come the fittings for the swing-back, which consists of two plates, and the small fastening which falls down in the slots, as will be seen in the illustration (Fig. 23). I think the figure will need very little description as to the working of the swing-back. As shown, the camera is folded up and not in use. To use the swing the small clip is raised, which releases the under plate; then draw the back out till the clip falls down into the second slot, and after the desired position is gained, it is clamped by the plate and thumbscrew (Fig. 25). After the plates are cut and filed up, place the under plate in position, and mark round on the wood; then cut the necessary wood out with a sharp chisel for the plate to fit in; then mark the position for the clip, leaving a sufficient distance for it to work up to release the plate, and cut the wood away, so that it will slip up and down quite easily. Then screw the top plate in its position, and proceed with the other side in a similar manner. The slots in the under plate are filed with the small hand file.

Next will come the clamping screw and plate (Fig. 25). This plate has a long slot in the centre, as shown, in which the thumbscrew passes through and is fixed into the side of the camera, after the plate is cut and the edges filed up. Mark the distance for the slot, then punch a number of holes with the punch, and drill out with the drills, file up with the stand-file, so that the thumbscrew will pass up and down freely. The plate is screwed to the swing-back with a screw.

You will require three small brass thumbscrews as Fig. 26; two for the horizontal and vertical slides, and one for the swing-back. Each screw is supplied with a small female screw, which is screwed in position in the camera. If the camera is made as described with the side flap running the full height of the camera, one plate, as Fig. 25, will have to be secured from slipping up and down by a round-headed screw, which should be screwed so that the plate will work rather stiffly, but not too lightly. If desired, you may

use a thumbscrew at this side; if so, the side flap must be cut down, so that the screen will have free course.

Fig. 27 is a small brass button, which is screwed into the bottom groove of the back, and keeps the focussing screen in its proper place. The ground glass is kept in its position by three of these buttons; there is one at the side of the camera near the top, which keeps the dark slide from pulling out when the shutter is drawn (see Fig. 15, page 65).

Fig. 24 is a small clip, which is secured to the bottom of the camera, and holds the side flap in its place at the back of the camera when folded.

Fig. 29 is the female screw, which receives the clamping screw for the purpose of securing the camera to the tripod. These screws should be let in flush with the wood.

The plates that hold the base and side boards rigid when in use are shown in Fig. 20; the plate on the side flap is made of very thick brass; that on the base-board, of No. 19.

After all the fittings are made and fitted in their places, and work easily, take them off, and they are ready for lacquering. The reason they are not lacquered before they are fixed is, that they would be very liable to get scratched or dirty.

The object of lacquering is to preserve a polish that is already obtained, and not to give a polish, as is the general idea; so, therefore, you must polish your fittings up with the fine emery paper; and if the edges are bevelled, they will look all the more finished.

After the fittings have been heated to a comfortable heat, give them a very thin coating of gold lacquer, which will cost about 3d. per ounce. Apply with a good camel-hair brush, of moderate size; cost, about 10d. to 1s. 6d., according to size. The brush should be broad enough to cover the breadth of the widest plate, and you must not go over the same surface twice, but must be done with a steady, single sweep. In the illustrations, all the woodwork is drawn to $\frac{1}{4}$ scale; the fittings full size.

For the convenience of my readers who do not care to make their own bellows and fittings, I have made arrangements with Mr. Marcus Waine, of 39, *Legh Street*, *Warrington*, to supply complete sets for the camera, as described, or any separate parts. Of course, I do not expect the amateur will attempt to make his own rack, pinions, and thumb-screws; so therefore I have fully described the necessary requirements, and Mr. Waine will, no doubt, quote for any article desired.

Now our camera is complete, and only requires polishing, which will be treated on in a future article.

(*To be continued.*)

VELOCIPEDES:

THEIR CONSTRUCTION AND USE.

By A. STEPHENSON.

VI.—FRAME, BRAKE, HANDLES, ETC.

WE now come to deal with the frame of our tricycle. The frame is composed of iron tubing, $1\frac{1}{8}$ inches in diameter outside measure. The long tube which occupies the right side of the machine, and to which the steering wheels are connected fore and aft, is 4 feet 9 inches long. The steering centres are brazed into the ends of this tube, as already mentioned. Fig. 1 is a side view of this tube, showing various connections. As will be seen, it is curved upwards along its central part. The two ends are kept straight in line with each other, so that both steering centres will stand perfectly vertical. The curved part is the arc of a circle, and has a rise from the straight of about 3 inches. Tubes are generally bent hot, but in this case the bend is so slight that it may be done cold. I bent mine by passing it through a hole in a thick bench top; the tube being long, a good leverage is obtained.

On the centre of the tube is a connection called a T (Fig. 3, enlarged). It has a branch projecting upwards at right angles, which receives the end of the arched tube, which stretches to the other side of the frame. These T's, as well as the tubing, may be bought from gas engineers. The T's are screwed to fit the exterior diameter of the pipes. The pipes when screwed are cut nearly half through, and so very much weakened, consequently quite unsuitable in a tricycle frame, where any strain is to be put upon it; so, instead of making the long tube in two parts, and screwing the ends into the T, I file out the T sufficiently to slip it on to the tube, and the tube for this purpose should be filed bright and clean. The T should be driven along the tube somewhat tightly, as the neater the fit the better will it hold brazing metal. If it is tight put on, it may be brazed without pinning, otherwise a small hole is drilled through one side of T and tube, and a pin driven in to make sure the T will not turn or shift in the process of brazing. The T marked B is put on in the same way, but with its branch turned downwards to receive the depending tube which carries the pedal shaft. It is sufficiently in advance of T A to show 5 inches of the tube between them. In this space, and close up to T B is a bracket, or lug, which carries the steering handle. This bracket is shown (Fig. 4); A is the upper side, B the edge. It is made of iron 1 inch broad and $\frac{5}{16}$ inch thick. The ends are of unequal length, and when fixed on the tube it has the long end undermost. The object of this will be seen from an

FIG. 6.—RODS FOR STEERING ARRANGEMENT. Scale, 3 in. to foot.

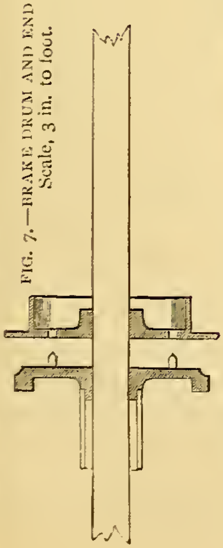


FIG. 7.—BRAKE DRUM AND END OF HUB. Scale, 3 in. to foot.

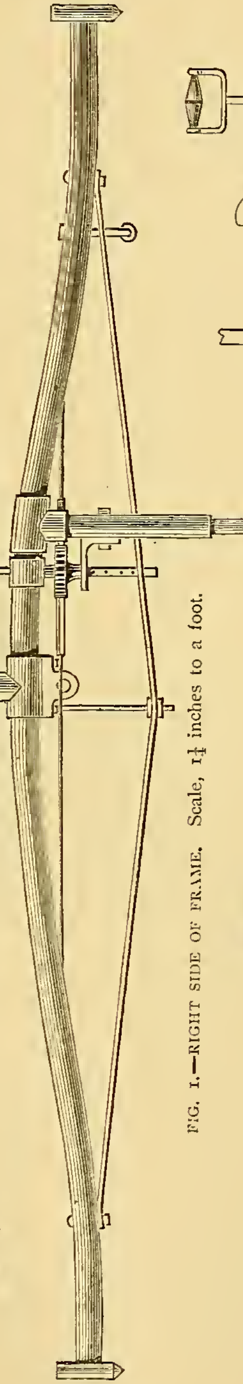
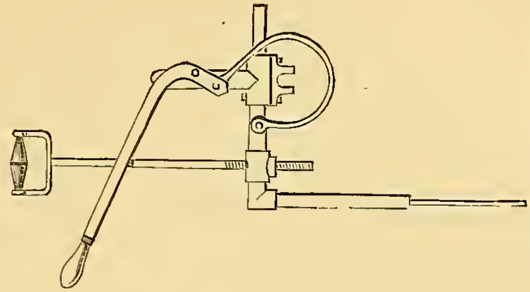


FIG. 1.—RIGHT SIDE OF FRAME. Scale, $1\frac{1}{4}$ inches to a foot.



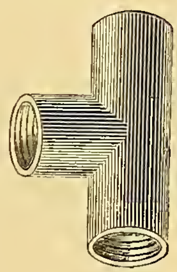


FIG. 3.—TEE. Scale, 3 inches to a foot.

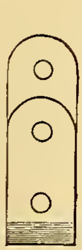


FIG. 4(A).—HANDLE BRACKET. Scale, 3 in. to foot.

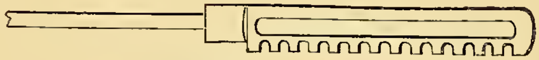


FIG. 5.—STEERING RACK. Scale, 3 in. to foot.

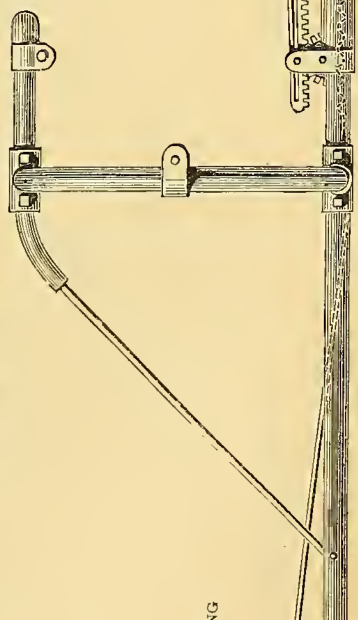


FIG. 2.—PLAN OF FRAME FROM ABOVE. Scale, $1\frac{1}{4}$ in. to foot.

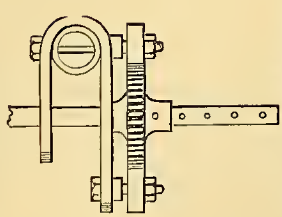


FIG. 4(B).—BRACKET WITH STEERING PINION. Scale, 3 in. to foot.

FIG. 8.—LEFT HAND SPADE HANDLE. Scale, $1\frac{1}{4}$ in. to foot.

examination of the figure, which shows a section of the steering pinion and the two ratchet pieces. The ratchets have a long slot (see Fig. 5); through this slot a bolt passes, which bolt is secured to the bracket on either side of the pinion, one of the said bolts passing right up through bracket and tube. To further secure it it may be brazed. A similar bracket, but with both ends equal, is fixed to the opposite side of the frame for the other handle. The two ends or jaws are screwed $\frac{1}{2}$ inch, and the handle-rod has some 4 inches of its lower end screwed. Its handle-rod thus passes through both jaws of the bracket, and when placed at a suitable height is locked with a nut under the bracket. The steering handle-rod, however, passes through plain holes in its bracket. It also passes through the pinion which has a long boss. A series of holes are bored through the handle-rod, and one through the boss of the pinion, so the handle is in this way adjustable through some 4 inches by simply inserting a pin through any desired hole, and through the boss, the holes in the bar all coinciding with that in the boss. The handle with its pinion is prevented from dropping downwards by a small angle bracket (┏) attached to the depending tube, as shown (Fig. 1).

Under the T, in the centre of the long tube is shown the axle bearing. This is bolted on, the bolts passing up through both T and tube. One of the bolts is extended downwards some 6 inches, and holds in tension the long stay-rod called by engineers a "bow-string." This bow-string is 3 feet 9 inches long, of $\frac{5}{8}$ inch round rod iron; the ends are thickened up and made sufficiently broad to bore for a $\frac{1}{4}$ inch bolt. A simpler way that may be done without the aid of a blacksmith is to screw $\frac{1}{2}$ inch of each end of the rod, then heat and bend the ends upwards of a length to pass through the tube, when nuts are screwed on. To give the rod due tension, some two inches of the lower end of the short central stay are screwed; two nuts are used—one above and the other below the bow-string.

Fig. 2 shows the upper side of the frame complete. The arched cross tube is here shown with seat-rod bracket in the centre. This is also shown in elevation (Fig. 1).

In Fig. 2 the short tube on the off side is only carried sufficiently forward to carry the depending tube which carries the pedal-shaft on that side. It is furnished with a T to receive the end of the cross-tube on that side. A stay-rod starts from the back end of this T, and, after bending round, joins the long tube at an angle of about 45°, where the end is flattened and bolted on.

In Fig. 2 the steering arrangement is shown complete, the arms projecting from the sides of the forks are 3 inches in length. The rods are forked at the ends (see Fig. 6, A, B), and fitted with $\frac{1}{4}$ inch bolts and nuts. The two ratchets are cast in brass, and have on one end a solid piece, which is bored and screwed to receive the rod ends. The rods may thus be adjusted to a nicety in order to get the two wheels to run exactly in line.

In Fig. 1 is shown the depending tube on that side. It is of the same diameter as the long tube for about 12 inches of its length. Inside it is inserted a tube of $\frac{3}{4}$ inch diameter. It is turned smooth, and the brackets which carry the pedal-shaft bearings slide up and down for adjustment of the chain, the tube on the off side being, of course, got up in the same way. These depending tubes may descend to within 8 inches of the ground, the proper height of the crank bearings being some 10 inches or 11 inches above the ground.

In Fig. 1 is shown the seat-rod and spring in elevation. The seat, it will be seen, is adjustable. The rod is turned, and passes neatly through a hole in the bracket, which is firmly brazed to the cross-tube. A set-screw fixes the rod effectually at the desired height.

The left-hand bearing for the main axle is bolted under the T same as on the right side. The chain wheel is fitted on the axle inside the frame, close up to the bearing. It is keyed on, a slot being cut in the wheel boss, and a flat filed on the axle. The lower chain wheel is keyed on the pedal-shaft in the same way, and also inside the bearing. The brake-drum, 4 inches in diameter, is also keyed on the main shaft, close up to the outside of the bearing. This drum has a flange on one side to keep the strap in place; the surface for the strap is 1 inch broad. It is cast in brass, and is very light, the rim and flange being little over $\frac{1}{10}$ inch thick, and the web $\frac{1}{8}$ inch (see Fig. 7, which gives section of drum and flange of hub of driving wheel). In this section are shown two holes through the web of the drum of $\frac{3}{8}$ inch diameter. In the hub are two pins to correspond and enter these holes; so the drum being keyed on the shaft, the large driving wheel is simply slipped on to the axle. The pins enter the holes in the fixed drum, a nut is screwed on outside the hub, the end of the axle being reduced to $\frac{5}{8}$ inch for that purpose. The driving wheel is thus made a fixture to the axle, and at the same time may be removed in a few seconds by taking off the nut.

The brake handle is a bent lever of the form shown Fig. 8. It is attached to the frame on the left side in the manner shown, and pulled upwards towards the spade handle. The strap is spring steel one inch broad, and inside it is a strap of leather riveted on. I makes a first-rate brake, and is very powerful, stopping the machine in a couple of yards, without the slighest tendency to sway round or pitch the rider forward.

In Fig. 8, is shown the left-hand spade handle. In many machines this handle is pear-shaped, projecting forward from the rod. I prefer, however, to have it the same as the steering, both hands then grip the same form. I made these handles without the aid of a blacksmith.

The handle is a piece of iron $\frac{5}{8}$ inch broad, and $\frac{1}{8}$ inch thick, bent cold to the shape shown; the ends are bored for $\frac{1}{4}$ inch wire, and the centre bored and squared to receive the rod; the grip handle is of rosewood. It is first bored through its centre for the wire, then mounted in the lathe and turned to the desired shape; it is then placed in the forked piece after it has been firmly riveted to the rod. The wire is driven through, the ends filed nearly flush, and then riveted. The handles are, of course, finished up neatly by filing.

Having now shown and described every part of the machine, it remains to be said that there is nothing in it that the ordinary clever amateur mechanic may not readily do, even to the smith's work. The pedal-shaft may be bought in the rough, or finished from a maker, pedals in the same way; although I made my own pedals, I bought the cog-wheels and chains, together with the wheel rims and spike wire. The only smith's work I got done was the fork sides and the steering centres, and even these I drilled, screwed, and finished up. It is true the frame is made of gas tubing, and a maker would laugh at the idea; however that may be, the machine looks lighter, is as light in weight, is as rigid, substantial, and safe as any machine on the road costing twenty guineas, and mine cost less than four, not including labour, but including rubber tyres, which cost twenty shillings.

As to the merits of the machine itself, I have only to reiterate what I stated in the outset, that the Coventry rotary type of tricycle is, without doubt, the safest, surest steering, and best hill-mounting single-driving tricycle on the road. As to its safety in going down hill, I believe there is nothing to match it for safety in the whole tricycle family; in fact, you cannot make a spill with it, unless you deliberately twist the steering handle round, and even then the machine will not tip up, but keep its feet, so to speak, till it lands in the ditch.

I, therefore, with every confidence recommend this type of tricycle to the attention of all intending builders, as being easy to construct, easy to stable, easy to drive, and a good luggage carrier. In this latter respect, I have taken many lengthy trips with an eight-year old boy sitting behind on a seat I can attach for that purpose, and which adds only five pounds to the weight of the machine.

It is to be noted, also, that this type of machine requires no complex and costly differential double driving gear, as it has no two wheels to drive, hence the simplicity of its construction, and the small cost of the materials.

As to the general finish of my machine, there is not a vestige of nickel plating. It is simply painted a good black with red lines, and the brass parts left bright. Homely as it looks, however, it is much better than one I saw in Glasgow the other day—a "National" two track rear-steerer, made in Coventry. The get up of the iron work, and the general finish, was simply frightful; and the amateur who could not turn out a better finished tricycle should abandon mechanics and go in for farming.

Since commencing these papers, I have constructed a new tricycle, which I should like on a future occasion to show in print to the readers of AMATEUR WORK.

I have also constructed a bicycle of the safety family, and of a type I have not yet seen or heard of. This, also, I may have an opportunity of describing. Meantime, having done with our first tricycle, I will, in response to several inquiries, and with the approval of the Editor of AMATEUR WORK, be most happy to give a full description of the modern bicycle, the principles of its construction, the mechanical details of its parts, and the management of the machine as a vehicle of locomotion.

ORGAN BUILDING FOR AMATEURS.

By MARK WICKS.

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VI.—THE STOP ACTION AND COUPLERS.

THE next requisite for our organ will be the mechanism by which the sliders of the various stops are shifted in or out as may be required. This mechanism is of an extremely simple character, as will be seen by an inspection of Fig. 72, which is a plan, or view looking directly down, of the action known as the wooden trundle stop-action; and in Fig. 73 we have an isometrical elevation of this action, showing its connection with the slider. The most convenient arrangement for the stop knobs is, in the majority of cases, to place the bass stops on the left-hand side of the key-board, and the treble stops on the right-hand side of it. It is this kind of arrangement that the stop action now being described is especially adapted for. The letters marked on the diagrams refer to the same portions of both plan and elevation. A is the draw stop, the knob of which projects on the outside of the case of the instrument, and the other end of this stop rod is, for the sake of economy, generally mortised into a square rod, as shown at B. An upright roller, or trundle as it is termed, marked D, hav-

ing an arm C, to which B is connected by a centre-pin, and another similar arm E at right angles to the first one, is connected in the same manner to the trace F, in the lower end of which the lever G is fixed, and the upper end of the lever passes through a square or round hole in the end of the slider. The trundle D works on centres in a strip of wood both top and bottom, as more clearly shown in Figs. 75 and 76. When the stop knob is drawn out the arm C is pulled backwards, which thus causes the trundle to turn partly round; the arm E is drawn backwards and carries with it the trace and the lower end of the lever G; the upper end of the lever thus moves to the right and draws out the slider. When the stop knob is pushed in this action is, of course, reversed, and the slider closed.

The rod A is of ⅝ inch round mahogany; B, D, and F are each about 1½ inch square, and may be of any hard wood that will not warp. The rollers, or trundles, D, are about 8 inches long, and placed in a direct line one behind the other, about 6 inches apart, as shown in Figs. 75 and 76. The arms C and E are each about 4 inches long and ½ inch thick, thinned down at the ends where they are connected to the stop rod, or trace, as the case may be. The arm C is placed exactly opposite to the stop knob, but the arm E is generally nearer to the top of the trundle, but its exact position depends on the length of the lever G. If the rollers are made very short in consequence of the height above the key-board being less than 15 inches, the arms E may be much lower down, as it is obvious that it may be in any position in the length of the trundle that may be most convenient. The arms are both tenoned into the trundles, and the pins on which the trundles work should be stout and strong, and driven tightly in. The strip of hard wood, H, in which the top centres work may be about 3 inches wide and ¾ inch thick, and should be firmly secured to the framework of the instrument. A similar strip may be placed for the bottom pins to work in, or they may work in holes bored through the board on which the key-board rests. All these pivot holes must be bushed with woollen cloth to secure silent action. The trace F must be long enough to reach from the arm E to the lever when the stop is pushed in, and will, of course, vary in length according to the length of the sound-board of the instrument. The lever G is 2½ inches wide and ⅝ inch thick, made of hard wood and shaped as shown in Fig. 73. The upper end of the lever works in the slot in the end of the slider, and the lower end passes through a mortise in the end of the trace, and is secured by wire pins.

A still better way is round the lower end of the lever and pass it through a *round* hole in the trace, and drive a pin through the lever *below* the trace to prevent it slipping out, but allowing it to turn when the arm is drawn back. A rail 2 or 3 inches square is screwed on to the end of the sound-board, and grooves cut in it, the same as in a backfall rail, to receive the levers which are centred on a stout wire similar to backfalls. The levers may be sloped forwards as shown in Figs. 75 and 76, or they may all be perpendicular according to the space you have at your disposal. The levers are generally centred so that the lower part is twice as long as the upper part; thus, if the stop knob is made to draw about 1½ inches, the slider will move ¾ inch, which will be a very convenient length for both movements. The stop knobs are turned something like drawer knobs, and generally have a plate of porcelain or ivory let into them with the name of the stop on it. These can be purchased for a small sum, but if you prefer to make your own and save the expense, you can make the labels of paper and print the names on them, and glue them on to the stop knobs, giving them a coat of varnish to protect them from dirt. The label should show both the name of the stop and also its foot-tone, thus "Open Diapason, 8 feet," "Flute, 4 feet," etc.

Fig. 75 shows the stop action at the bass end of the single manual for scheme 1, the top knob being for the Principal, the next for the Stopt Diapason, and the lower one for the Violoncello. The order of the stops at the treble end would be—reckoning from the top downwards—as follows: 1. Flageolet, 2. Stopt Diapason, 3. Keraulophon, 4. Open Diapason. In order to show that it does not matter whether the upper or the lower knob is connected to the furthest slider, I have given, in Fig. 76, a view of the bass end of the two manual with stops arranged in the opposite way to those in Fig. 74. Here the top stop draws the Lieblich Gedacht on the swell organ, the next the Keraulophon, the third one the Stopt Diapason-bass of the great organ, and fourth the Flageolet. The Keraulophon might be made to draw from the treble end if you so desire.

The iron trundle action is still simpler than the wooden trundle just described. The trundle D works on a pivot at the lower end and in a collar at the upper end. The arm C is connected to the stop knob rod as in the other action, and a bent arm at the top of the trundle forms both the trace and lever. The trundle may be made of a piece of inch gas tubing, and the arms may be made of ⅜ inch iron rod passed through holes drilled in the trundle, and riveted at the back, the front end of the arm C being flattened out, and having a hole drilled through for the centre wire to pass. A piece of hard wood should be driven into the bottom of the tubing, and the iron pivot fixed firmly into it. If the trundle is made of solid iron, the top arm is merely a continuation of it, being bent over to the requisite shape.

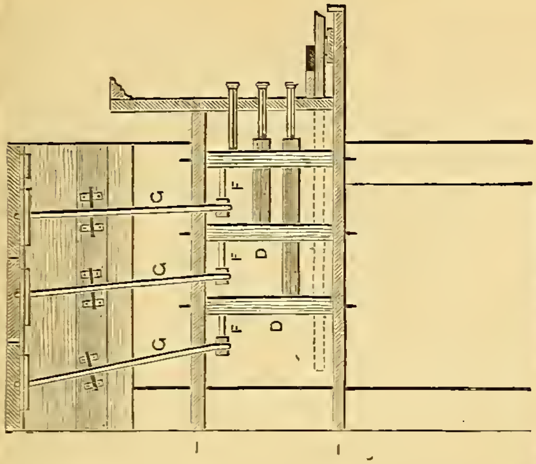


FIG. 75.—END VIEW OF WIND CHEST AND STOP ACTION. TWO MANUAL.

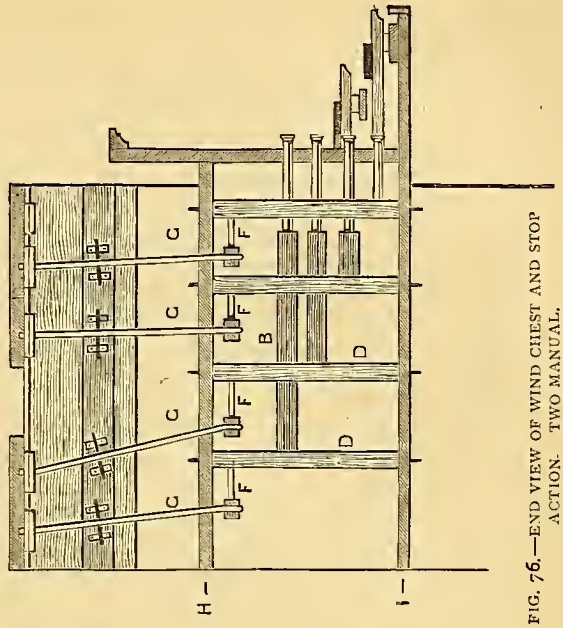


FIG. 76.—END VIEW OF WIND CHEST AND STOP ACTION. TWO MANUAL.

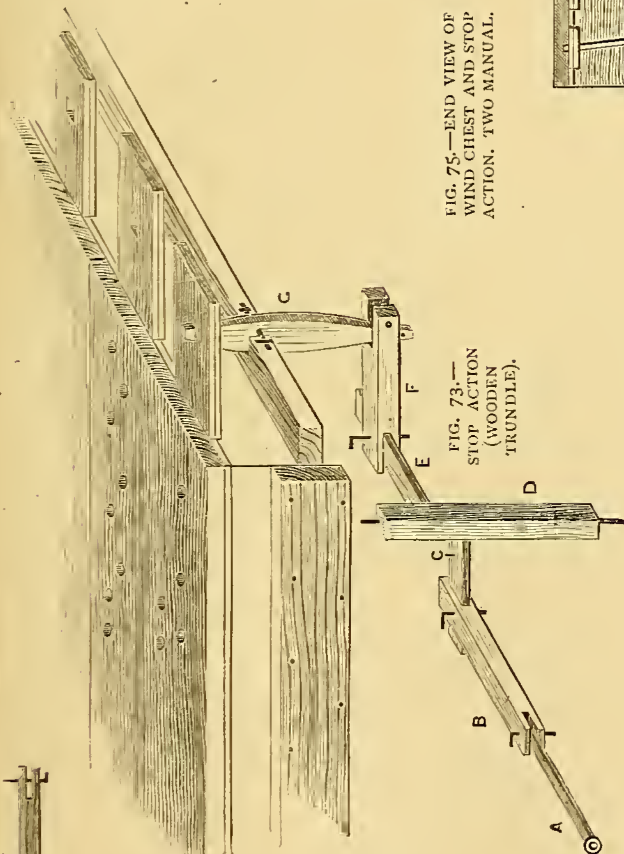


FIG. 73.—STOP ACTION (WOODEN TRUNDLE).

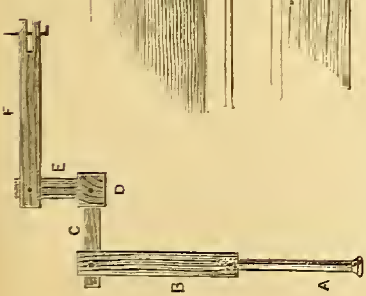


FIG. 72.—PLAN OF STOP ACTION (WOODEN TRUNDLE).

FIG. 77(A).—SQUARE

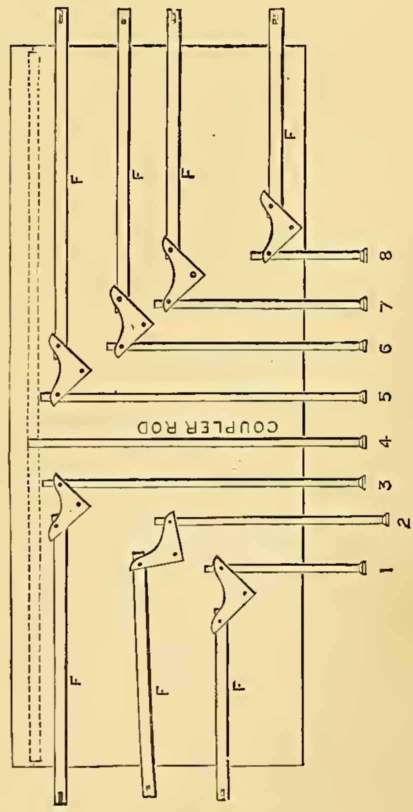


FIG. 77.—PLAN OF STOP ACTION IN A SINGLE ROW.

Another style of stop action, which is well suited for a small single manual organ with few stops—and especially where there is not sufficient height above the key-board for a trundle action—is shown in Fig. 77. A board about the same length as the sound-board, and nearly as wide, is placed just above the key-board, leaving just sufficient room for the keys to work. The draw stops are placed in a horizontal line over the key-board, and are connected at the back end to what is termed a square. This square is made of $\frac{3}{8}$ inch mahogany, mitred together as shown in the sketch, so that the grain runs parallel with both edges ; a saw cut is made in the thickness of it—starting from the sharp corner—down as far as the dotted line, and a piece of veneer is then glued into it, thus making the joint very strong. If the square was cut out of a single piece, it would be very liable to break when in use. A centre hole is made near the sharp corner and bushed with cloth, and a small hole is also made through near each of the other angles. The sides of the square are each about four inches long, the article, when complete, answering the same purpose, and being also very similar to a bell crank. Large bell cranks might indeed be used instead of wood squares. The cranks are screwed down to the board by a screw passing through the bushed hole, and through a little block of wood placed underneath the square to raise it the requisite height, and to prevent unnecessary friction. The rods marked F are the traces, which are connected at one end to the levers just the same as in the trundle action, the other end being connected by a screw or pin to the vacant corner of the square belonging to its proper stop rod. The stops shown are those for scheme I, the Principal being drawn out. In all these stop actions, the holes in the case through which the stop knobs pass should be lined with scarlet or some other coloured cloth, and a washer of the same material should be slipped over the stop rod close up to the back of the knob.

The centre wires shown for the different joints in the trundle actions, should be screwed at one end, and a leather button put on to prevent the wires falling out. All parts that rub together should be well blackleaded so that they may work smoothly.

The octave coupler, or diaocton, as it is sometimes termed, is shown in Fig. 78, and consists of a bridge with a set of backfalls and stickers immediately under the manual backfalls. The stickers of the coupler are placed as close to the manual stickers as they can be, without interfering with their action. The back ends of the coupler backfalls rest on these stickers directly over their own keys, but it must be distinctly understood that though in the diagram the front ends of this backfall appear to be connected to the front end of the manual backfalls of the same key, it is not so in reality, but it is connected to the front end of the thirteenth backfall higher up the scale. Thus, if we assume the key shown to be the CC note, the back end of the coupler backfall will be connected to its own sticker on that key, but the front end of it will be connected by the tapped wire shown to the front end of *tenor C* backfall of the manual action, and when the CC key is pressed down, and the coupler is in action, it will cause the CC note and the tenor C note to sound together. So on all through, the coupler backfalls, each being connected to the note an octave higher up the scale than that over which the tail end rests. The coupler backfalls will therefore slope to the right hand, whilst the bass backfalls of the manual will slope to the left. If a roller board is used to transfer the first four notes of the tenor octave on the manual to the treble side, a similar roller board must be used to transfer the first four notes in the bass of the coupler to those four notes in the tenor at the treble end. This roller board will be placed before the front ends of the backfalls.

It may perhaps be as well if I here mention something that want of space prevented me from referring to in the chapter on sound-boards. The organ will undoubtedly be much more perfect if there are twelve more channels in the treble portion of the sound-board, so that the octave coupler can be carried right up to the top G in treble. It is obvious that without this arrangement, the highest octave in the treble would not be coupled to any other notes, so that when using the coupler, it would be limited to the first $3\frac{2}{3}$ octaves on the key-board. If these additional channels are made, however, it will add six inches to the length of the sound-board, and necessitate the carrying of each stop in the treble, an octave higher, that is twelve more pipes will be required for each of those stops. These pipes will, of course, only be brought into use when the octave coupler is in action. Amateurs, therefore, must decide for themselves whether they will go to the trouble of making sixty tiny pipes, with the necessary channels, pallets, etc., for use with the octave coupler only. Very many organs are constructed without them ; but I thought it only right to mention it here when treating on the coupler action, so that those amateurs who wish their organs to be as perfect as possible, might be able to carry out their wishes.

The coupler is shown in the sketch as being out of action. When the stop knob is drawn out, it causes the coupler bridge with its backfalls to drop about half-an-inch, and it will then be in the position shown by the dotted lines, the front end of the backfall resting on the leather nut which is screwed on the lower end of the tapped wire, and the back end

resting on the top of its own sticker. The holes in these backfalls are made rather elongated so as to allow them to slip up and down on the wires of the stickers, and the tapped wires connecting them to the manual backfalls. The manner in which the draw stop accomplishes the requisite movement is as follows, viz., the back end of the stop rod is connected to the arm C, on the underside of a long roller running the whole length of the sound-board (see Fig. 79). Opposite each end of the coupler bridge there is another arm on this roller or trundle, which is connected to a jointed rod carrying a little inclined plane passing under a wheel on the end of the backfall rail. Fig. 81 gives a view of one end of the backfall rail or bridge belonging to the coupler. It will be observed that it is cut to a shoulder, and runs between two upright pieces of wood. The wheel projects from the end, and two similar wheels are fixed to the cross piece underneath, and on these wheels the rod carrying the inclined plane works. When the stop is pushed in the inclined planes are drawn backwards, thus causing both ends of the bridge to rise at the same time, and the wheels then rest on the little squares at the ends of the inclines. The coupler is then out of action, as the coupler backfalls are out of gear with the stickers and nuts on the tapped wires. On pulling out the stop, the inclined planes are pushed forward, and the bridge itself then rests firmly on the cross pieces at each end, and the coupler can be brought into use. The position in which the coupler trundle is placed, is shown on Fig. 78, at B, and it would thus be just behind the roller board, and quite out of the way of any part of the action. The upright guides for the ends of the bridge, and the pieces in which the centres of the trundle work can be fixed to the building frame where required. The arm connected with the stop-rod may be placed in any portion of the underside of the trundle, so that it is exactly opposite the stop knob.

The roller or trundle must be stout and strong, but need not necessarily be round. If of wood, it should be about 1½ inches diameter, and of well-seasoned material, the arms being mortised into it. If made of iron, ¾ inch gas tubing would do very well, making them up in a similar way to the iron rollers for the roller board. The arm or connecting rod, which passes between the stickers, must be of very thin hard wood, or stout sheet brass. This arm is marked D on Fig. 79. The rods carrying the inclined planes should be tolerably stout so as not to bend at all, and should run between flat pieces of wood in order to keep them horizontal. The wheels may be of hard wood turned specially for the purpose, or may be formed of stout reels, on which sewing-machine cotton has been wound, and should be covered with leather to secure silent action. The holes through the centres should be bushed with cloth ; the centre wires must be very strong, and the ends tapped to admit of a nut being screwed on to keep the wheels in position.

The inclined planes may be two inches or three inches long, and should rise about half-an-inch, being just sufficient to allow the action to be out of gear when the coupler stop is closed. These inclined planes should also be covered with soft leather, and all parts well blackleaded where they rub.

If this action is made to work the reverse way—that is, as it would appear if you hold the page up to the light, and look through the paper at the drawing, or as it would be seen reflected if held before a mirror—it could be placed under the backfalls instead of behind the stickers, which, however, I think is the best place for it.

Another kind of movement for effecting the shifting up and down of the coupler bridge is shown in Fig. 80. This is merely a roller with two cams on it which is fixed directly under the bridge (see No. 2, Fig. 78), the cams working against two little wheels fixed on the under side of the bridge. The cams can easily be made as follows :—Take a piece of ¾ inch mahogany, and with the compasses strike two segments with a radius of 4 inches each, and about 1½ inch below the centre cut a hole in each for the roller to pass through, and then cut the segment out as shown in the enlarged view. The top left hand corner should be flat, as this part supports the bridge when the coupler is out of action, and the whole of the top edge should be covered with soft leather. The cams should be securely fixed on to the trundle, and the draw-stop rod may be fixed either to the further side of one of the cams or to a separate arm according as it may be most convenient. The cams being fixed to a trundle at a point below their centre causes the front ends to be higher than the back ends are when brought to the same position by drawing out the stop knob, and this causes the bridge to rise or fall according as the stop knob is pushed in or drawn out. It will be understood that the ends of the bridge rest firmly on the cross pieces when the coupler is in action, but when it is out of action the bridge is supported by the little wheels resting on the square part of the inclined planes, or of the cams, as the case may be.

The directions for the octave coupler apply to either a single or two-manual instrument, but the coupler now to be described will only be applicable to instruments of the latter class. It is called "the swell to great unison coupler," because when it is in action it couples the swell organ to the great organ, so that both organs can then be played from the great organ key-board, and when you press a key on the great

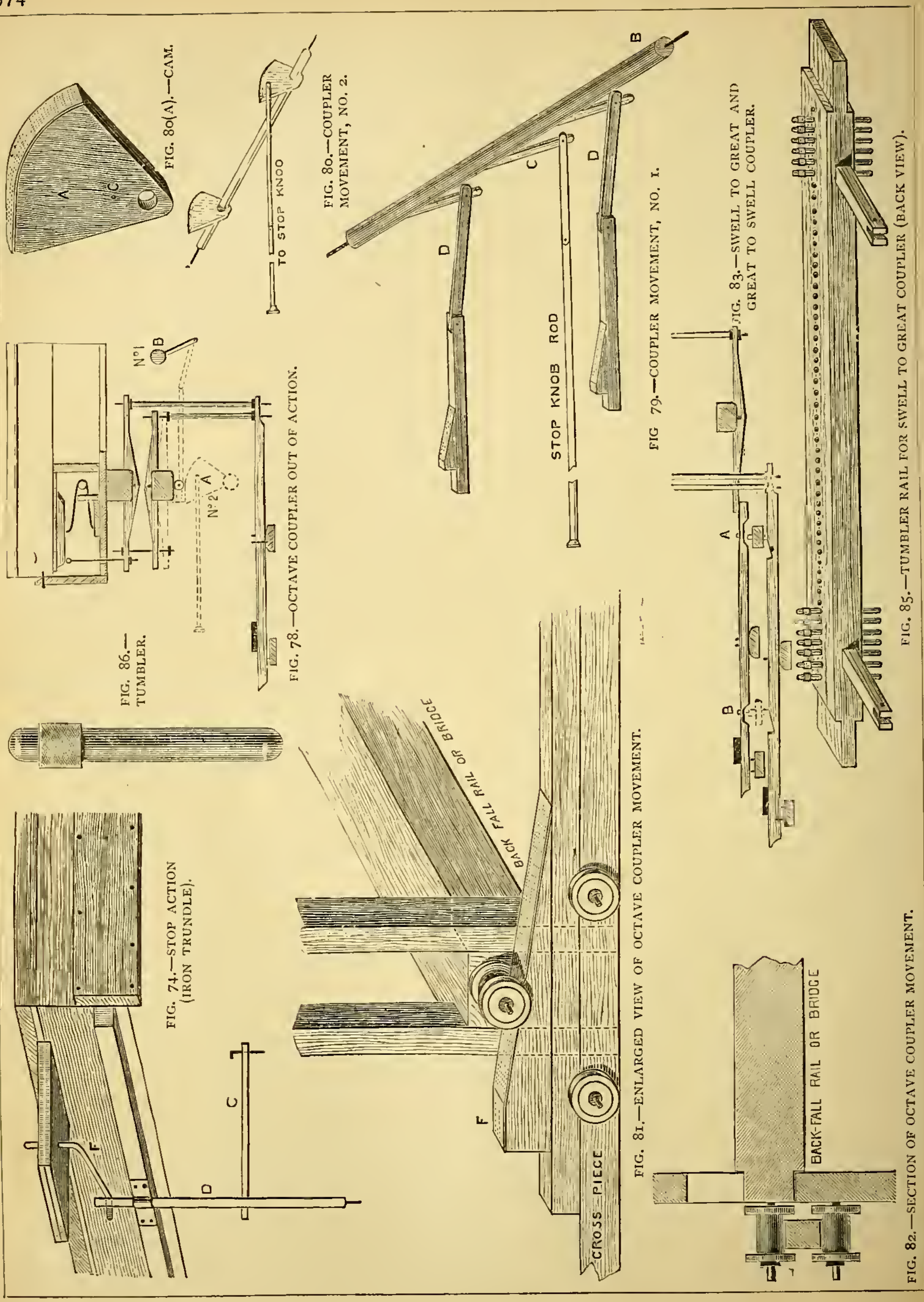


FIG. 80(A).—CAM.

FIG. 80.—COUPLER MOVEMENT, NO. 2.

FIG. 86.—TUMBLER.

FIG. 78.—OCTAVE COUPLER OUT OF ACTION.

FIG. 79.—COUPLER MOVEMENT, NO. 1.

FIG. 83.—SWELL TO GREAT AND GREAT TO SWELL COUPLER.

FIG. 85.—TUMBLER RAIL FOR SWELL TO GREAT COUPLER (BACK VIEW).

FIG. 74.—STOP ACTION (IRON TRUNDLE).

FIG. 81.—ENLARGED VIEW OF OCTAVE COUPLER MOVEMENT.

FIG. 82.—SECTION OF OCTAVE COUPLER MOVEMENT.

organ it pushes up the tail end of the same key on the swell. This coupler is shown in position at A, Fig. 83, and an enlarged view of it with the action also connected with it is given in Fig. 84. A bar, or rail, of wood is placed between the two rows of keys, near the tail end, and the ends of the rail run in a slot in each cheek of the key-board. A short round sticker, termed a tumbler, runs loosely in a hole directly under the centre of each swell key. A groove is cut in each key, both upper and lower, as shown in the sketch, and when the coupler is in action the tumbler is in the position shown in Fig. 84. A tapped wire, with a wooden or thick leather nut covered with soft leather on the under side, runs through every swell key in the position shown, and by screwing this wire up or down the action of each tumbler may be regulated to the utmost nicety. When the tumbler is out of action it is the upper row of keys and marking in pencil over the centre of each one of the lower row. Carefully bush all these holes with soft woollen cloth, and then, with a small bead plane, strike off sufficient lengths of mahogany beading to make the tumblers, and cut them to the requisite length, viz., the exact distance between the upper flat surface of the great keys and the flat under side of the swell keys. Smooth the tumblers well so that they slide easily in the bushed holes prepared to receive them, then round them at each end with a piece of glass-paper; but be careful not to make them too short, and cut a strip of soft leather and glue a piece of it round each tumbler near the top, as shown, in order to prevent it slipping too low when out of action. The surface of the grooves in the lower manual keys must also be covered with leather, black-leaded, so that the tumblers will

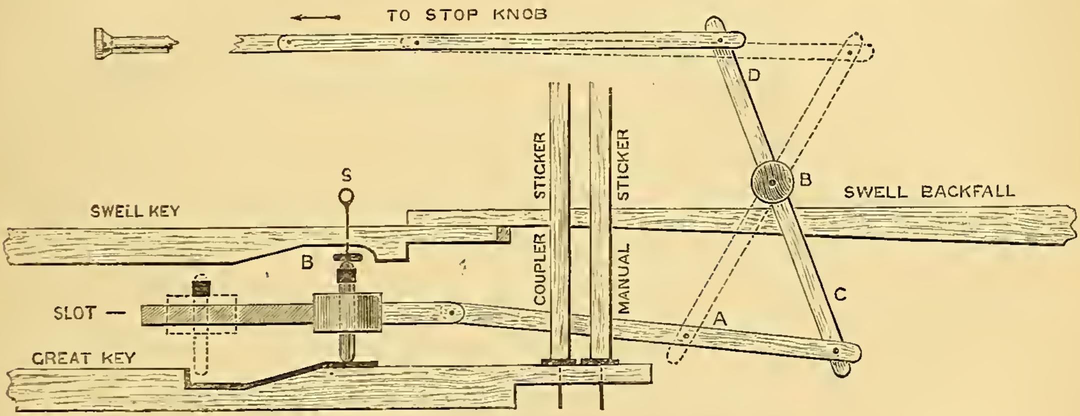


FIG. 84.—SWELL TO GREAT COUPLER. ENLARGED VIEW.

in the position shown by the dotted lines, and is out of gear with the keys. If the coupler were placed as shown at B on Fig. 83 it would couple the great organ to the swell, so that both the organs would be played from the upper manual, and it would then be called "the great to swell unison coupler." There are many different couplers in use, but these are the simplest, and it is not necessary to describe every variety. The tumbler rail should be of oak or mahogany 2½ inches or 3 inches wide, and about 1¼ inch thick. It is shown in Fig. 85, and you will observe that a shoulder, or tenon, is formed at each end of it; the length of the rail up to these shoulders being the exact width between the two cheeks of the key-board, which will be about 2 feet 6½ inches. The tenons work in a mortise, or slot, in the key cheeks, which slots must be made about 5 inches long so as to allow sufficient travel for the rail. Bore a hole about ¼ inch diameter directly over the centre line of each key on the great organ, the positions of the holes being obtained by removing glide easily up the incline when drawn back by the stop action.

The draw-stop action for the swell to great coupler is very similar to that belonging to the octave coupler. A roller, or trundle, B, shown in section on Fig. 84, is made exactly similar to that shown in Fig. 79, with two arms on the under side, and a flat rod, C, connecting each arm to the short arms shown on the back of the tumbler rail in Fig. 85. The arm D, connecting it to the stop rod, is, however, on the upper side of the roller, and, as will be seen, the angle at which it inclines is the same as that of the lower arms. The movement is shown in action, but when the stop is pushed in the arms will be in the position shown by dotted lines. The arms, C, and the connecting rods, A, must be thin so as to allow them respectively to pass between the swell backfalls or the stickers on the great organ keys.

Great care must be taken in fixing the trundles for any of these coupler actions, in order to secure their

perfectly level and parallel working. The coupler great to pedal will be described in the next chapter, which will deal with the pedal action generally.

(*To be continued.*)

A DESIGN FOR A MUSIC-STAND.

By F. J. DURRANCE.

(*For Illustrations, see Supplement to this Part.*)

I SEND description and drawings of a music-stand, which I have recently designed and made for my own use; it will also do for reading or painting, and is immediately adjustable for both sitting or standing. The most difficult thing for an amateur to make would be the sliding or telescopic portion, Fig. 1. This part can, however, be easily obtained from any ironmonger's, and is known as a three-draw toasting fork (cost about 10d. or 1s.) By unscrewing the ring portion, then the fork itself (sometimes this is soldered in, and can be easily removed by making hot enough to melt the solder), you have the article ready at once to receive the fittings. The ordinary ones have a thick tube, black varnished for the bottom part (and which contrasts well with the lacquered brass); its other portions are burnished brass. To those requiring a first-class article, there is one sold for 2s., having a richly-embossed tube, burnished on the higher portions, which looks handsome when made up. Those of us not having access to a lathe could make a modified form, or could get some kind friend to make the turned portions. Before commencing, I may say that Figs. 1 and 2 and 2 A are quarter-size; all the rest of the drawings are working size, and can be measured off direct.

The first part to make will be the wooden stand, Fig. 2, and is made from thin wood about $\frac{1}{5}$ inch thick and $\frac{3}{4}$ inch wide; a blind lath (Venetian), or better still, some printers' reglet or furniture, would do very well; it can be halved together and glued, making all flush, as Fig. 3, or be simply fastened together with short screws, as Fig. 4. This way would necessitate slightly altering Fig. 6, and is not near so good as the former. When the frame is finished, *two* pieces of wood must be firmly fastened to the bottom portion, and holes bored to receive the brass wires, Fig. 5, for holding back the music. They must be slightly flattened and pointed, then pushed in the holes a very tight fit, or better still, screwed in a screw-plate, as drawing. Now give it its first coat of black paint or varnish, made by dissolving shellac in methylated spirit, and adding a little lamp or gas black, which, by the bye, is a good thing for coating either metals or wood, and is very useful to the amateur carpenter or fret-worker. When dry it must be well rubbed down with glass-paper, and is then ready to receive the movable joint, to enable it to be set at any angle. It is made from brass plate about the thickness of an ordinary door-plate; in fact, any engraver will let you have pieces out of his scrap-box for a few pence, suitable for the purpose. Cut out one cross-shaped piece as Fig. 6, drill four small holes and countersink them for very thick and short screws, next cut out *two* pieces as Fig. 7 and *one* of Fig. 8, which must be inserted between the two latter, and pinned or soldered in its place. All the pins or rivets required can be obtained from ironmongers, and are known as upholsterers' brass pins, and can be obtained almost any length and thickness. They have rounded heads, and are useful for many purposes to an amateur. A very simple and easy way to solder all such work is to slightly moisten the surfaces to be soldered with the ordinary salts; then place a small piece of tin-foil between, make hot, and when you see tin-foil melt, press firmly until cold, and after filing up you can scarcely discern the joint. A square hole is now made in the centre of Fig. 6 by drilling a round hole, and filing out with a flat file; this is to receive the first part of the joint. The second portion must be turned in the lathe, the top part, a ball (as shown by dotted lines) then cut down with a saw or filed off, leaving the middle portion standing, which must be filed a nice fit to go between Fig. 7. A hole is now drilled through all three, and a pin inserted and riveted, so that it will just move nicely. A couple of thin washers outside (as calliper washers) would improve it. The bottom pin must be a tight fit in the top tube of the stand (Fig. 9 A), and must be pinned or soldered where the fork was in the first instance. The finished joint must now be inserted in the square hole and soldered or riveted in its place, then filed off flush, and after lacquering screwed to the centre of wood frame, which can now receive its last coat of paint; if the screws go through the woodwork, cut off the points and file flat before finishing off. Now for bottom portion (shown in section, Fig. 10), which must be made of thicker stuff than the top. Cut two pieces, Fig. 7 and 7 A; turn a brass ring, Fig. 13, to be inserted between these pieces, drill a hole in the centre about $\frac{3}{8}$ inch, next turn up in the lathe, Fig. 12. The top part, a very tight fit in *bottom* part of sliding tube; the bottom part to go through holes in ring and the two plates. Now cut *three* pieces as Fig. 14, and turn three small feet as shown in section Fig. 10. All the several pieces must now be drilled together to make a nice fit. Lastly, drop one of the plates on Fig. 12, then the ring, next the second plate (see the holes are opposite, better put pins in their places), then rivet

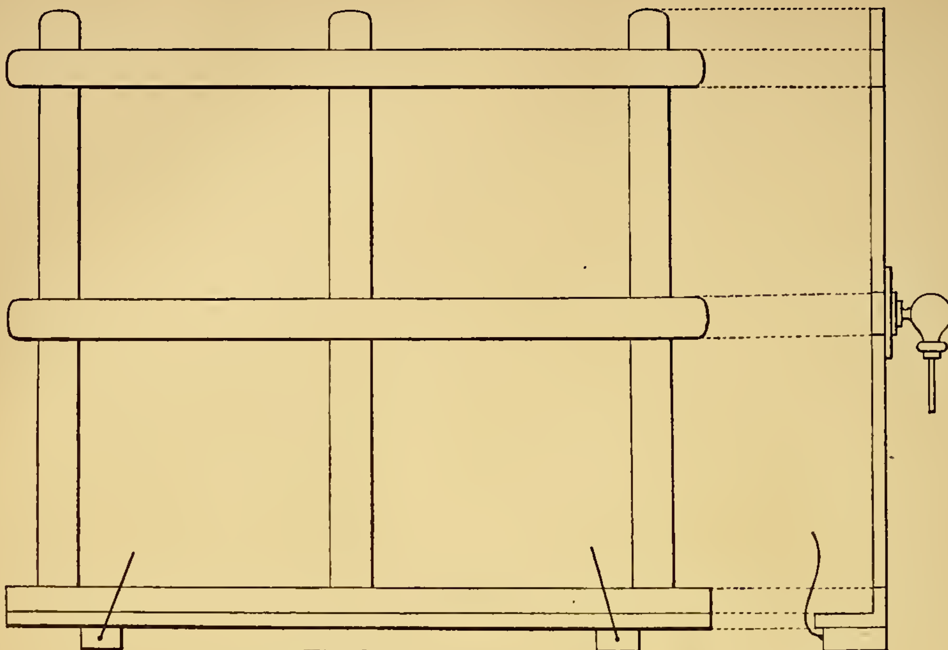


Fig. 2.

Plan of Wood Frame

Fig. 2A.

Side Elevation of Frame

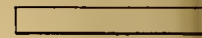


Fig. 1.

Fig. 7.

Pl

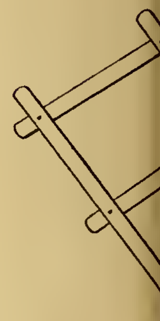


Fig. 14.

Plan of the Feet Bars

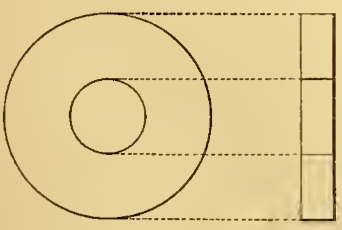


Fig. 13.

Centre Ring.

Fig. 13A.

Section of Ring

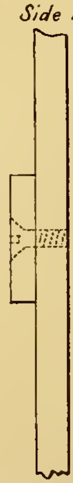


Fig. 4.

Side View of One of Joints of Frame

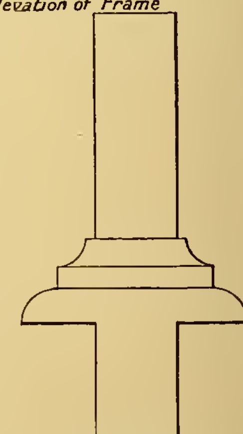


Fig. 12. *Turned Pillar for Base*

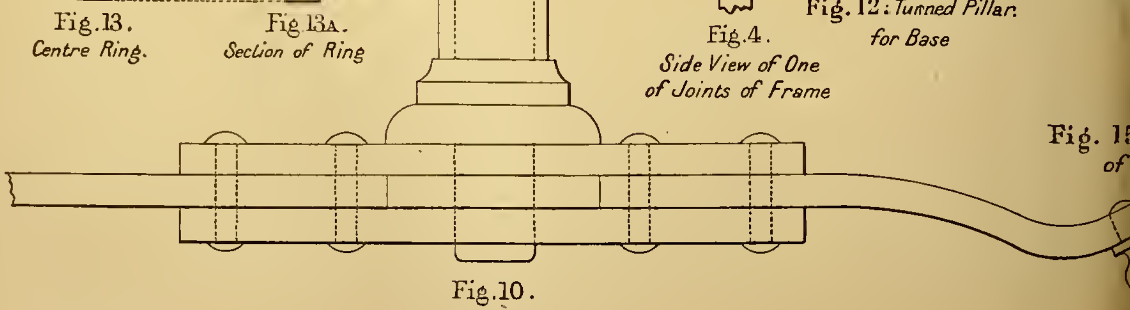


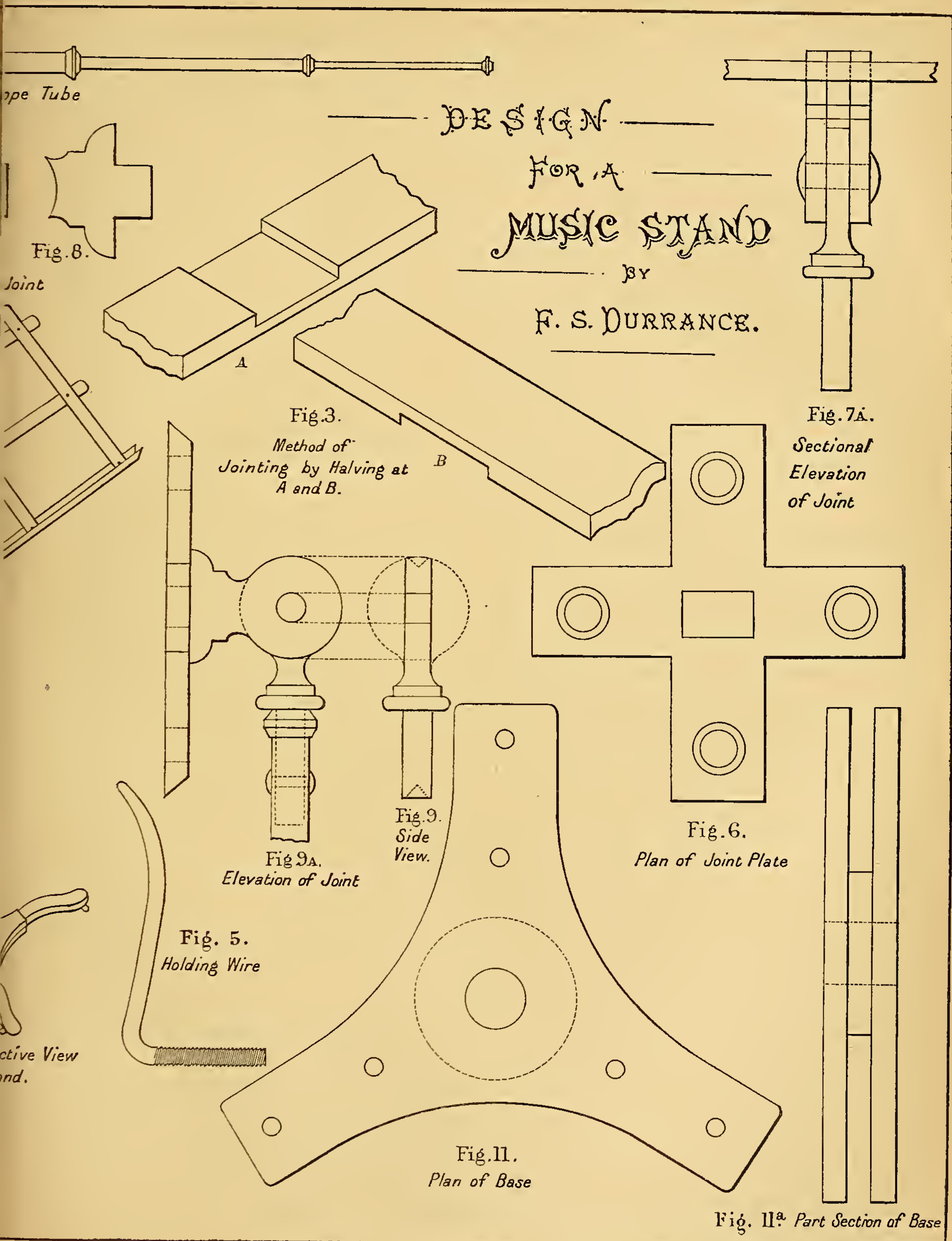
Fig. 10.

Section of Base

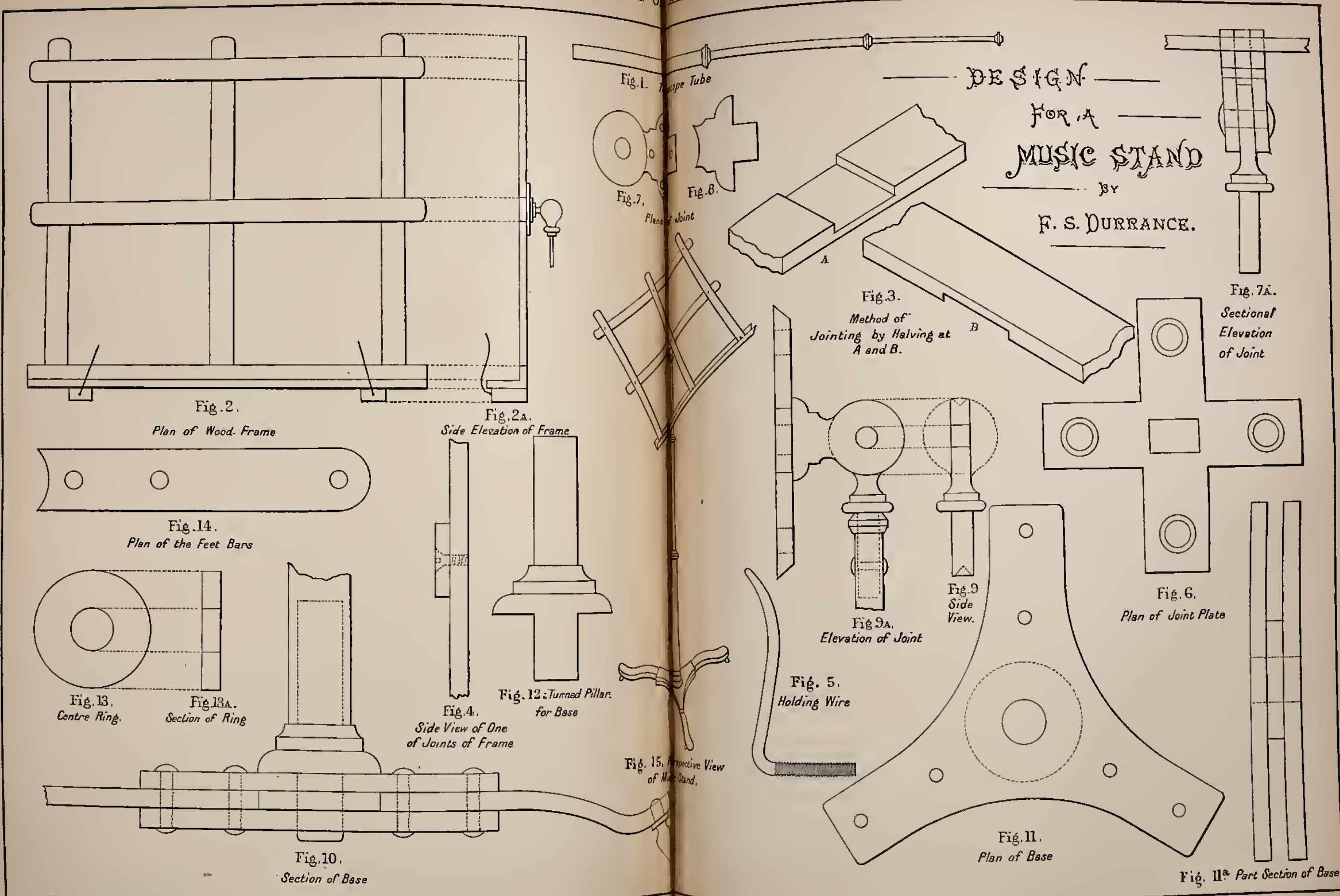
Fig. 15

of

Ward, Lock & Co., Warwick House, Salisbury Square, London, E.C.



pe Tube
DESIGN
FOR A
MUSIC STAND
BY
F. S. DURRANCE.
Fig. 8.
Joint
A
Fig. 3.
Method of Jointing by Halving at A and B.
B
Fig. 7A.
Sectional Elevation of Joint
Fig. 9A.
Elevation of Joint
Fig. 9.
Side View.
Fig. 6.
Plan of Joint Plate
Fig. 5.
Holding Wire
ctive View
nd.
Fig. 11.
Plan of Base
Fig. 11a. Part Section of Base



Ward, Lock & Co., Warwick House, Salisbury Square, London, E.C.

over or solder; next fasten the small feet into the three pieces, Fig. 14; bend them all to one curve, insert between plates, and rivet. After lacquering, knock into the tube, and if you like make secure with a pin through, but if it is a good fit this is scarcely necessary. To prevent the feet scratching the piano top or table, cut small pieces of tubing (feeding-bottle tube) and place over the three feet. By laying the stand horizontally on the table, it is very convenient for reading or water-colour drawing. If there is anything which is not made plain, I shall be glad to answer any question.

RUSTIC CARPENTRY.

By ARTHUR YORKE.

II.—SUMMER-HOUSES OF MEDIUM SIZE.

IN Fig. 8 we have a summer-house, a trifle larger, and also somewhat better screened from weather. As may be seen from the ground plan, Fig. 9, it is in form a long octagon. Its measurements are, from end to end, 10 feet; from back to front, 6 feet; height to the eaves (as in the last example) 6 feet; and height to ridge-piece, 10 feet.

In the details of construction, this summer-house will be seen chiefly to differ from the smaller one in the method employed in forming its walls. These, as shown, are built in a very expeditious manner. The straight larch poles are simply ranged side by side. These trees, if grown in thick plantations, are so regularly shaped, that they will, without chopping, fit together with sufficient exactness. The chinks left between will not be serious, and may be stopped in the manner to be described hereafter.

If the top ends of the uprights employed are sawn, as in Fig. 10, and then nailed on both sides to the wall-plates, it is evident that any movement above will be impossible. Below, they may be let into the ground, two or three inches; and further held in place by nailing the ledges along the inner side, sixteen inches from the ground-line, which are eventually to carry the back of the seat, and which will thus serve a double purpose.

In Fig. 11 the arrangement of rafters in the roof is made sufficiently plain. The two small upright rods at the ends of the ridge-piece, are intended to be the future centres and supports of straw pinnacles; to be formed round them at the completion of thatching.

Along the front of this summer-house, except at its entrance, runs a light fence of open-work, 2 feet 6 inches high. This trellis serves to enclose and give completeness to the building, and is intended to support creepers of the lighter kinds. It is made of round wood—larch of small growth; and in this, as in all similar open work, it will be desirable to use the method of sawing the ends of pieces, shown in Fig. 10, wherever practicable.

The tops of the front collar-posts will be seen to be decorated with some diagonal pieces of rough wood—oak or apple-tree. These will serve as a support for creepers, which may be trained up the pillars.

In the sketch, I have placed this summer-house on a little bank, and have made the approach to it by two rustic steps. If such a site can be selected, the building will undoubtedly be more effective than if merely constructed on level ground.

Leaving the method of finishing the interior of the house for another paper, I will proceed to describe the most appropriate method of covering or roofing rustic summer-houses.

Thatching.—There is but one way in which, without violating the laws of fitness and good taste, a rustic summer-house can be covered, unless, indeed, the building is so contrived as to keep the roof entirely concealed. This has not been attempted in either of the examples which I have given, for, in my opinion, the shade and shelter, as well as the ornamental effect to be gained by eaves, are not things to be disregarded. When seen surmounting a building of rustic woodwork, every covering of slates, tiles, or metal, looks out of place, and suggests jarring ideas. The only thoroughly appropriate roof is one of thatch.

Thatching is a simple operation, and one which, with paying attention to a few essential points, may easily be performed by anyone, sufficiently well to keep a building dry. Really good thatching, however, can only be the result of practice, and involves some technical skill; and there are few things in which the difference between good and bad work is more marked. Really good thatching will stand for twenty years; average thatching is only computed to last for ten.

If a good thatcher is to be found in the neighbourhood in which the work is to be done, I should rather advise the amateur builder to engage him than to undertake the business himself. A thatcher expects only the wages of a first-class labourer, and not those of a mechanic, and is not, therefore, a costly workman. In many districts, however, no professed thatcher is to be met with, and the readers of AMATEUR WORK have, moreover, a right to know how everything can be done; so I will describe the process of thatching as briefly as possible.

When a building which has already been thatched has to receive a new coating, the best as well as the cheapest material is stubble, which is the lower and stiffer part of wheat straw. But for thatching a new building stubble is not long enough, and straw, or a

mixture of straw and stubble, is preferable. It has first to be damped, and the water well shaken and soaked into it, and it is then straightened with the hands, so as to lay the straws as nearly as may be parallel to each other. When the person who "draws" the straw has straightened as much as one can conveniently take up at once with the two hands, he lays it aside. Such a double-handful is technically called a "yelven." For use, a number of these yelvens are placed in a "jack," which is merely a forked stick, capable perhaps of holding a dozen or more of them. They are kept separate by laying them across each other at a slight angle.

When the thatcher is mounted and ready for work, he hangs the jack, by a little hook fixed to its end, to one side of his ladder, and proceeds to cover a strip of the roof, reaching from eaves to ridge, on the other side of his ladder. He takes a strip just so wide as to be easily within his reach. If the piece of roof on which he is at work is square, then the strip from bottom to top will be of equal breadth. If the space is triangular, the strip will taper regularly upwards. A strip of thatching is technically known as a "stelch."

The manner in which the yelvens are arranged in

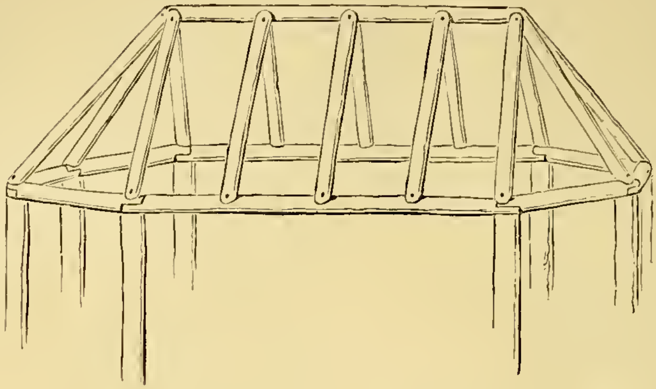


FIG. 11.—CONSTRUCTION OF ROOF OF MEDIUM SUMMER-HOUSE.

FIG. 12.—SECTION OF THATCH SHOWING BUCKLE.

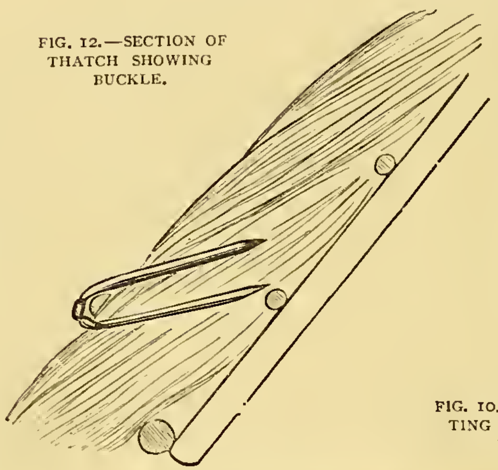


FIG. 10.—MODE OF CUTTING UPPER ENDS OF UPRIGHTS.

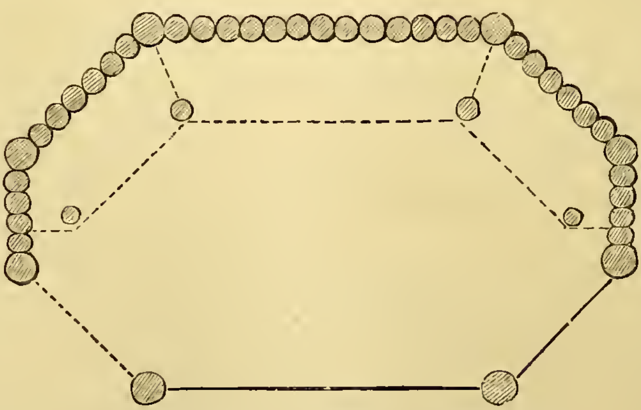


FIG. 9.—GROUND PLAN OF MEDIUM SUMMER-HOUSE.

the jack enables the thatcher to take them out one at a time without confusion. He begins by forming the eaves at the bottom of his stelch. In re-thatching old work, the new material is kept in place by thrusting the upper ends of the straw into the old thatch with a wooden spud. In wholly new work, the straw has to be bound to the rafters and laths with "tar-cording." This is passed, by means of a gigantic needle, through the layer of straw towards the upper end of the yelvens, where the stitches will be completely overlapped and hidden by the next layer.

The layer which forms the eaves having been laid and secured, the thatcher places another above and overlapping it so far as to cover all but just the lower ends; and thus he goes on, building up his stelch and making layer to overlap layer, till he reaches the ridge, and at intervals he binds down his straw to the woodwork beneath with the tar-cording.

When the thatch has been laid he combs it down with a gigantic comb—an instrument resembling the head of a rake with the teeth knocked out at one end so as to form a handle. The object of this combing is to draw out any loose short straws which, by lying crosswise, might obstruct the free course of water, to bring the

straw of the thatch more completely into that regular longitudinal direction necessary to throwing off the rain quickly and effectually, and generally to give a neat appearance to the work, which, when finished, should be perfectly even and uniform.

In laying the second and all after stelches, care must be taken thoroughly to blend the straw with that which forms the edge of the former stelch. In care, or want of care, shown in this particular, lies one of the great differences between good and bad thatching. If the two are not properly united a weak joint will be formed, through which rain will probably find its way.

The work has to be still further secured and bound together on its surface by "buckles" and "runners," which may be seen indicated in the general views of summer-houses. Buckles are made by taking withes about as large as a little finger, and splitting them. For such work as that before us they should be from 12 to 18 inches long. The two ends are pointed, and the middle is shaved somewhat thinner than other parts, to admit of being twisted. The twisting is done by placing one end under the foot, and giving them two or three turns with the hand. This gives the fibres in the middle, where they have to be doubled, a spiral direction, like that of the strands in a rope, and prevents any danger of breaking. They can then be bent together, end to end, and are ready for use; they now look like ladies' hair-pins on a large scale.

The runners are merely long strips of split withe, which are laid so as to form horizontal bands along the thatch. These are held down by the buckles, through the loops of which they run, and which are thrust firmly into the thatch. In pushing in the buckles, an upward direction must be kept, as shown in Fig. 12, otherwise the water would trickle down beside them and make its way through the roof. The runners are braced down by buckles at intervals of from six inches to a foot, according to circumstances.

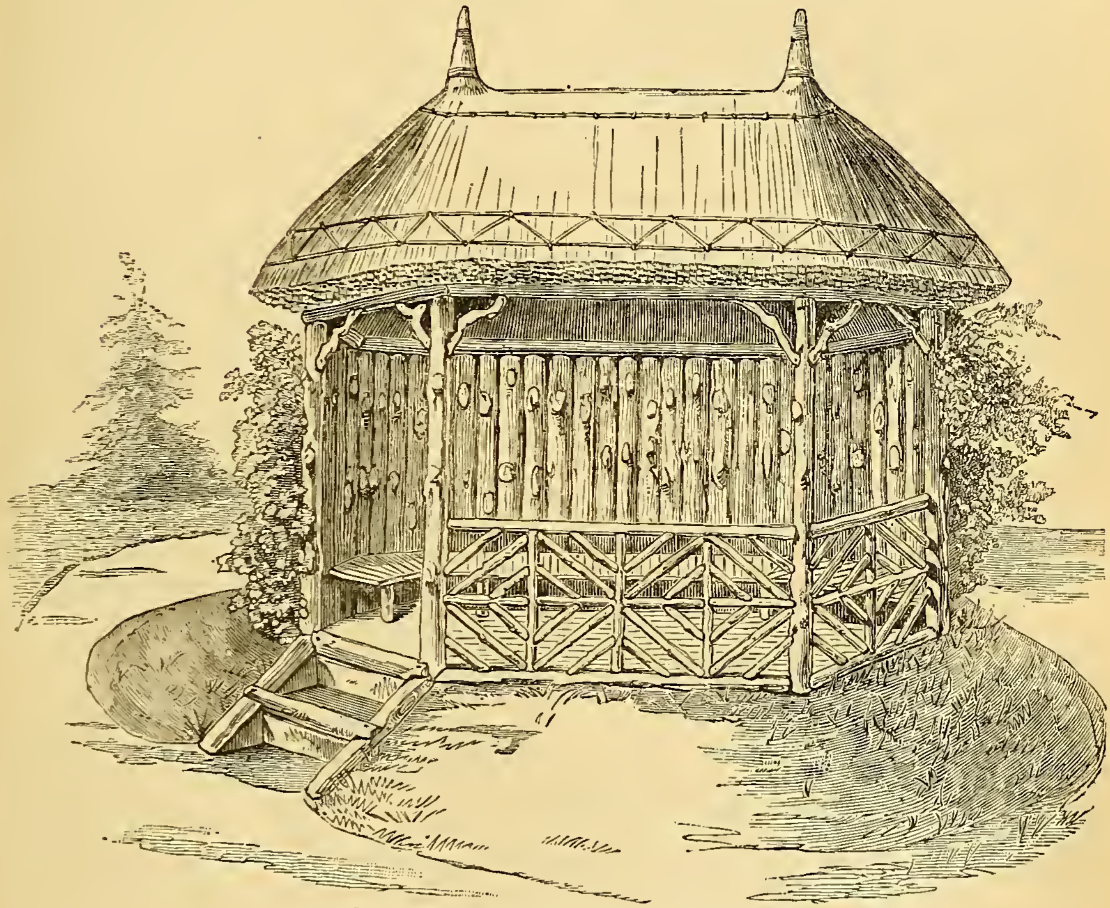


FIG. 8.—DESIGN FOR SUMMER-HOUSE OF MEDIUM SIZE.

It is always usual to buckle-down the thatch at a few inches below the ridge, and at a few inches above

the eaves. Wherever the thatch is particularly exposed to wind, extra bands of buckles and runners are added. In plain thatching the runners are disposed in simple lines only; the crossed and zig-zag arrangements, seen in the illustrations, are adopted for the sake of ornament.

After being bound down, the eaves require to be pared, and made even, and trimmed with shears.

The method of finishing off and uniting the thatch at the ridge is in the best work accomplished by a kind of plaiting, but how this is done it would be impossible to describe intelligibly. A much simpler and easier plan is to cap the ridge with mortar, made of common road dirt. Houseleek, or stonecrop, planted on this, soon overspreads it, and renders it by no means unsightly. The rustic pinnacles, shown in Fig. 8, are made by surrounding an upright rod with straw, and binding it tightly.

In the small summer-house, Figs. 1 and 2, it will be seen that at the point where the thatching has been finished, that is immediately above the hinder end of the ridge-piece, the roof rises much higher than at the front end of that timber, though the ridge-piece itself is level. The extra height is gained by making-up with straw; and this is an expedient that may be resorted to whenever it may be found useful. Thus any irregularity in the rafters matters little when they are to be thatched upon. Any depression can easily be made up with straw, and the level of the outer surface thus preserved.

(*To be continued.*)

BRAZING AND SOLDERING.

By GEORGE EDWINSON.

IV.—SOLDERING JEWELLERY.

WERE I to give full instructions on repairing articles of jewellery, these papers would be indefinitely extended, and the poor, struggling competitors with foreign importations would justly cry out against me. I will, therefore, say that such is not my intention; but, at the same time, will state that a little aid may safely be given to the amateur who wishes to mend a brooch-pin, a chain, or a similar article, at home, when that home is situated at some distance from a working jeweller's shop. Articles of jewellery bought of "cheap jacks" at country fairs are usually made of brass or of German silver, although sold under more highly-sounding names. Imitations of gold sold under the name of aluminium gold, and other fancy names, should be really described under the name of brass—perhaps electro-gilt, but more often merely dipped—for they are only made of a species of brass or bronze. Those made to imitate silver may be of German silver (a kind of brass whitened with nickel), of Britannia metal, or of zinc; it will be well, therefore, to determine the quality of the metal before we attempt to solder it. Not long since I had a cruet-frame sent me to be re-plated; it was bought at a "cheap jack's" stall, for 5s. 6d., and was dear at that price, for it was made up as follows: handle and recesses, brass; frame, stamped Britannia metal; bottom, tin plate, soft soldered on; feet, stamped brass—the whole thinly electro-plated; total value not more than 2s. Now, if an amateur had tested the handle or the feet to ascertain the quality of the metal, and had proceeded to solder the frame on the assumption that this also was brass, he would have been surprised to see the whole ornamental parts drop from the rest in a shapeless mass. In mending such composite articles as these, the softest solder only is admissible, with the greatest care in its use, and it will be found safer to use the soldering-iron than the blow-pipe. This latter tool may be used in soldering small articles made of brass to imitate gold, or of German silver to imitate silver, and for the majority of such jobs a soft solder composed of pure grain tin two parts, and clean bright lead one part, will be found most easy to work, with the solution of chloride of zinc as a flux. Manufacturers of this class of jewellery use a solder nearly approaching the article in colour and not far below it in strength and fusible point, but the amateur will require considerable experience in soldering before he will be able to safely venture with hard soldering such articles. A little information on the subject, however, will not be deemed out of place, and may prove interesting to my readers.

Brass.—Paris brass is composed of 88 parts copper, 12 parts zinc; Geneva brass is made of 80 parts copper, 20 parts zinc; pinchbeck, of 83 parts copper, 17 parts zinc; Bath metal, of 78 parts copper, 22 parts zinc; Princes' metal, of 70 parts copper, 30 parts zinc; and Birmingham brass, of 61 parts copper, 39 parts zinc. These may all be hard soldered with Bath metal solder, composed of 79 parts tough brass and 21 parts of zinc, using borax as a flux, or soft "spelter" may be bought and used for the purpose; but amateurs will do well to use one of the most fusible solders mentioned in my last.

Aluminium Gold.—An alloy of copper with aluminium in the proportion of 96 parts copper to 4 parts of aluminium has a beautiful golden tint; other proportions of aluminium with copper make alloys resembling various qualities of gold, and mixtures of zinc or even of iron with certain proportions of the above-mentioned metals are also sold under the specific term "gold," but "all that glitters is not

gold." These so-called "golds" may be easily brazed with soft spelter or other fusible-coloured solder, using borax as a flux.

Gold.—This term covers a variety of alloys in which the precious metal itself is employed in varying proportions. This will be seen at a glance from the following table compiled from information contained in the "Practical Gold-Worker," by Geo. Gee.

Quality.	Gold.	Silver.	Copper.	Melting Point.	Specific Gravity.
23 carat	23 parts	½ part	½ part	2,102° Fahr.	19 05
22 ,,	22 ,,	1 ,,	1 ,,	2,009° ,,	19·08
20 ,,	20 ,,	2 ,,	2 ,,	2,002° ,,	18·68
18 ,,	18 ,,	3 ,,	3 ,,	1,995° ,,	17·87
15 ,,	15 ,,	3 ,,	6 ,,	1,992° ,,	47·05
13 ,,	13 ,,	3 ,,	8 ,,	1,990° ,,	15·74
12 ,,	12 ,,	3½ ,,	8½ ,,	1,987° ,,	14·86
10 ,,	10 ,,	4 ,,	10 ,,	1,982° ,,	13·06
9 ,,	9 ,,	4½ ,,	10½ ,,	1,979° ,,	13·02
8 ,,	8 ,,	5½ ,,	10½ ,,	1,973° ,,	12·82
7 ,,	7 ,,	8 ,,	9 ,,	1,960° ,,	12·05

Imitation Gold Compo 16 parts, Spelter 8 parts, 1,587° Fahr. abt. 8·5

Compo., or composition, is a mixture of copper and zinc used by jewellers in alloying gold, and the spelter above-mentioned is commercially pure zinc, not the soft spelter used as a solder. The following table will show the qualities of solders suitable for soldering each quality of gold, bearing in mind that the melting point of the solder used must always be several degrees below the melting point of the alloy to be soldered, and in the lower qualities of gold only the No. 5 solder should be used.

White Solders for Gold Work.

No.	Name.	Fine Silver.	Copper.	Spelter.	Fusing Point.
1	Hard Solder	16 parts	3½ parts	½ part	1,866° Fahr.
2	Medium	15 ,,	4 ,,	1 ,,	1,843° ,,
3	Easy	14 ,,	4½ ,,	1½ ,,	1,818° ,,
4	Common Hard	12½ ,,	6 ,,	1½ ,,	1,826° ,,
5	Common Easy	11½ ,,	6½ ,,	2 ,,	1,802° ,,

Coloured Solders for Gold Work.

No.	Name	Fine Gold	Fine Silver	Shot Copper.
1	Best Gold Solder	12½ parts	4½ parts	3 parts
2	Medium ,,	10 ,,	6 ,,	4 ,,
3	Common ,,	8½ ,,	6½ ,,	5 ,,

The coloured solders are used in soldering gold articles that have to be coloured after the process of soldering, and should therefore match the quality of the articles as near as possible in order that they may colour properly. The colouring process will be given further on, but it may be well to state here that gold articles below 14 carat quality should be soldered with the No. 5 white solder, and electro-gilt after soldering to restore the colour.

It must be understood that the word "carat" merely indicates a proportionate part of gold, and a "part" may mean any weight from a pound to a grain. Thus, in calculating the necessary weight of metals to make 18 carat gold we may put them down thus:

Gold, 18 grs.; silver, 3 grs.; copper, 3 grs.;—total, 24 grs.; or,
Gold, 18 lbs.; silver, 3 lbs.; copper, 3 lbs.;—total, 24 lbs.

Well dried, powdered borax is the only flux used, and the solder may be applied in the form of filings mixed with a little borax, or in small flat chips of sheet solder named "pallions."

Silver.—The term "silver," too, covers a variety of alloys in which silver is employed, and many others, innocent of the least trace of silver, this will be seen at a glance from the following table compiled from information published in "The Silversmith's Handbook," by Geo. E. Gee. This book and its companion before-mentioned will be found most invaluable to both amateur and professional jewellers. They are published by Messrs. Crosby Lockwood & Co., at 3s. per volume in Weales's Technical Series

Table of Silver Alloys.

No.	Name.	Silver.			Copper.			Nickel.			Spelter (Zinc).			Cost per oz.		
		oz.	dwt.	gr.	oz.	dwt.	gr.	oz.	dwt.	gr.	oz.	dwt.	gr.		s.	d.
0	Filigree Silver	Pure			0	0	0	0	0	0	0	0	0	abt.	5	0
1	Standard, Hall	0	19	6	0	0	18	0	0	0	0	0	0	,,	4	11
2	Standard, Coin	0	18	12	0	1	12	0	0	0	0	0	0	,,	4	8
3	Silver Alloy	0	18	0	0	2	0	0	0	0	0	0	0	,,	4	7
4	,,	0	16	0	0	4	0	0	0	0	0	0	0	,,	4	1
5	,,	0	15	0	0	5	0	0	0	0	1	0	0	,,	3	10
6	,,	0	14	0	0	6	0	0	0	0	0	0	0	,,	3	7
7	,,	0	13	12	0	6	12	0	0	0	0	0	0	,,	3	6
8	,,	0	13	0	0	7	0	0	0	0	0	0	0	,,	3	3
9	,,	0	12	12	0	7	12	0	0	0	0	0	0	,,	3	2
10	,,	0	12	0	0	8	0	0	0	0	0	0	0	,,	3	0
11	Common Silver	1	0	0	0	17	0	0	13	0	0	0	0	,,	2	6
12	,,	1	0	0	0	16	0	0	10	12	0	3	12	,,	2	3
13	,,	1	0	0	1	2	0	0	15	0	0	0	0	,,	2	0
14	Chinese Silver	0	18	0	1	0	0	0	4	0	0	6	0	Cobalt, 3 dwt. 18 gr.		
15	Imitation ,,	0	0	0	1	0	0	0	6	12	4	18	0	abt.	0	0
16	,, ,,	0	0	0	1	0	0	0	3	18	0	1	22	,,	1	0
17	German Silver	0	0	0	2	16	0	1	0	0	1	4	0	,,	0	0
18	,,	0	0	0	2	10	0	1	5	0	1	5	0	,,	0	0

Besides these, there are a large number of other alloys manufactured to resemble silver, but in most cases entirely innocent of even a bare contact with that metal, although sold under the name of English silver, Albata silver, Potosi silver, Nickel silver, and silverine. These together, with many others, such as niogene, nickeline, and siderapthite, only differ from German silver in having a larger or smaller quantity of nickel or of zinc, or in a slight addition of tin, iron, cobalt, bismuth, or antimony. The commercial value of these imitations of silver rarely exceed 2s. 6d. per lb., and many of them cost even less than that. But the value of articles made from them is not governed by the intrinsic value of the alloys themselves. Not a few have been invented and brought into our markets at a great cost to their inventors; they have been used in articles of new design, and in every instance the costs of manufacture have to be added to the cost of invention and design before the vendor can sell them at a profit. If he sells these imitation goods honestly, describing them as such, or as electro-plated articles, we can find no fault with him, even when he charges a price nearly approaching to the value of such articles when made of sterling silver;

but as there are unprincipled vendors to be found in every town, it will be well to know how to test the quality of such goods.

Testing Silver Wares.—Crush one ounce of bichromate of potash to a fine powder, and mix it with two ounces of water and six ounces of nitric acid. Rub a clean spot in some obscure part of the article, and apply a drop of the mixture on the end of a glass rod or fragment of glass ; note the effect, if it turns to a lively blood red, the surface of the article is of pure silver, but the hue of the drop will be less bright and lively if the silver is alloyed, and this depreciation will be most marked in the commonest silver. Now make a deep scratch or file mark in the same spot, and again apply the mixture ; if it then turns brown we may suspect the article to be made of German silver electro-plated. Wipe off the brown spot with a sponge, and apply a drop of nitric acid to the spot ; if this fumes up into green froth, our suspicions are confirmed. If the mixture turns black on the test spot we may suspect Britannia metal ; and Mr. Gee says that the colour will vary with all other metals and their alloys.

Having determined as near as possible the quality of the article to be soldered, we shall be in a better position to select a suitable solder from the following list :—

SILVER SOLDERS.

No. Name	Fine Silver.	Shot Copper.	Brass.	Zinc.	Tin.	Arsenic.	Compo.
	oz. dwt. gr.	oz. dwt. gr.	oz. dwt. gr.	oz. dwt. gr.	dwt.	dwt.	dwt. gr.
1 Hardest Silver Solder ...	1 0 0	0 5 0	...	...	...	...	...
2 Hard	1 0 0	...	0 6 16	...	...	...	...
3 Easy	1 0 0	...	0 10 0	...	...	...	...
4 Best hard ...	1 0 0	0 4 9	...	0 0 15	...	...	...
5 Medium.....	1 0 0	0 5 8	...	0 1 8	...	...	...
6 Easy	1 0 0	0 6 12	...	0 2 4	...	...	...
7 Common	1 0 0	0 9 15	...	0 2 9	...	...	...
8 Enamelling	1 0 0	0 5 0	...	...	...	...	...
9 Ditto	1 0 0	0 10 0	...	...	...	...	...
10 Filigree	0 16 0	0 0 12	...	...	...	...	3 12
11 Quick running	1 0 0	...	...	...	...	2 0	10 0
12 Chain	1 0 0	0 10 0	...	0 2 0	...	...	...
13 Easy chain ...	1 0 0	...	...	0 2 0	...	...	10 0
14 Common ...	1 0 0	0 12 0	...	0 3 0	...	...	...
15 Common Easy......	1 0 0	...	...	0 3 0		...	12 0
16 Very common	1 0 0	...	...	...	...	1 oz.	1 oz.

Some persons affect to favour a special solder for German silver and the other imitations of silver, in which some of the imitation alloy is mixed with zinc or tin to increase its fusibility (such as German silver, 5 parts; zinc, 4 parts) ; but the amateur will find the No. 15 of the above table suitable for this class of work. Very soft white metal is soldered with tinman's soft solder, and this same solder is used in soldering most common articles. Silver solders are sold by dealers in jewellers' requisites and metal warehousemen at about six shillings per ounce, or even less for the more common qualities. Although I have given the requisite proportions for each class of solder, I do not advise the amateur to make his own solders, except in those rare cases when he cannot get the desired quality elsewhere. Craftsmen and amateurs who wish to make their own solders will find the Injector Furnaces and Crucibles, sold by Mr. Fletcher, *Museum Street*, *Warrington*, very handy for the purpose of melting the metals when a supply of gas is at hand. Mr. Fletcher also makes an apparatus for making gas from petroleum for use with his furnace. The price of an injector furnace, capable of melting two pounds of metal is 38s., this includes blower and tubing complete ; a pair of tongs and a pair of crucibles will cost about 2s. extra. A furnace of the same size, fitted with a petroleum or benzoline gas generator complete, will cost 75s. As a blower will be necessary in the larger operations about to be described, I may mention here that the same blower will serve both the blow-pipe and the Injector Furnace. Messrs. J. J. Griffin and Sons, 22, *Garrick Street*, *Covent Garden*, *W.C.*, also make and sell many various appliances in the form of furnaces and blowers to be used in melting metals with a gas flame, and they also advertise an oil furnace for melting metals, such as iron, brass, copper, silver, etc. This furnace is sold in two sizes, the smaller at 21s., and the larger at 31s. 6d.

In melting the ingredients for gold or silver solders we must follow the rule already laid down, viz., to put the most infusible metals first into the crucible, and to add such ingredients as tin, zinc, and composition, after the other ingredients have melted. The composition above referred to consists of two parts of copper and one part of zinc, melted together and then granulated. When No. 10 solder has to be prepared, we may mix the ingredients together in the crucible, melt them, well stir them with an iron rod, and granulate the alloy ; then proceed as before directed for making hard solders. In making No. 11 solder we first melt the silver, then add the "compo" and the tin. But in making such a solder as No. 16 the arsenic must be withheld until the last, then flung in, stirred briskly, and when melted poured at once. Solders in which silver, copper, and brass only enter may be mixed and melted together. Solders should only be melted twice—once to granulate and mix the ingredients, and once to melt and pour into the ingot ; subsequent melting will destroy the more fusible or volatile parts, and render the rest drossy, hard, and brittle.

The following extract on soldering is taken from "The Silversmith's Handbook" : — "The mode of

soldering gold and silver is as follows: Take the solder and roll it out thin, or file it into dust, according to the kind of work in hand. If filed into dust, it is all the better if done very fine; and if reduced to a flat state it should be tolerably thin, and cut into little bits or pallions, which may be easily performed with a pair of hand-shears, cutting the bits first lengthways and afterwards crossways. When this is done, take the work to be soldered, join it together by means of fine binding wire (very thin iron wire) or lay it upon the pumice (or other support) so that the joinings can come close together, and will not be liable to be moved during the process; wet the joinings with a solution of borax and water mixed into a thick paste, applying it with a camel's-hair pencil; then lay the bits or pallions of solder upon the parts to be united, and having placed the article upon some suitable object (a fire-brick, for instance) take your blowing instrument and blow with it through a gas-jet (such as shown in Fig. 12) a keen flame upon the solder in order to melt it, and this will render the unification of the parts complete and perfect." I have followed Mr. Gee so far as he here directs, but must beg to modify his directions for the benefit of my readers. I find that it is not always best to put the pallions of solder on the joint until the flux has been dried, I therefore first direct a sweeping broad flame from the blow-pipe on and around the joint until the borax has dried, swelled up, and subsided, this it will do in a few moments; I then put on the solder, and again warm up the joint by directing the flame under and around the joint instead of into it. When the joint is hot, I sweep the solder with the reducing flame of the blowpipe, and sweep it into the joint just as it fuses, flushes, and trembles with the heat. The whole process only takes up the time of a few minutes to each joint. But though thus minutely described, I do not expect a beginner to succeed at first, for only a practised eye can detect the right heat, and a skilful hand properly direct the blast. Amateurs should only use the most fusible solders, avoiding arsenic solders altogether (as being injurious to health), and when called upon to solder plated articles it will be safest to use soft solder, as in soldering tinman's goods.

If the general directions above given are adapted to the details of a job, it will not be necessary for me to specify each article, for the treatment will be similar in each case, bearing in mind that solder filings made into a paste with the flux are used in fine long joints where pallions would be troublesome. We have now to consider the treatment of the article after it has been soldered.

Gold articles above 14 carat quality which have been united with coloured solder must have the surplus solder (put on by the amateur) carefully and smoothly filed off with a fine file, then rubbed smooth with a hone or a piece of oil-stone, and then smoothly polished with wash-leather and rouge. Prepare a mixture of equal parts, nitric acid and water, in a pipkin or other stone or eathenware vessel capable of holding water at boiling point. Prepare also the following mixture in another pipkin: Saltpetre, 7 ozs.; common salt, $3\frac{1}{2}$ ozs.; alum, $3\frac{1}{2}$ ozs; pound them fine, mix well together in the pipkin, heat very gently over the fire or the gas stove until the ingredients melt, then stir with a wooden spoon or glass rod, and when it begins to boil up add one fluid ounce of muriatic acid and stir it up again; when it again boils it is ready for the work which must have been previously prepared in the following manner: Place the soldered gold article over the fire on an iron or on a copper shovel, and heat the article until it is black, then plunge it into the acid mixture above-mentioned. It should be attached to a platinum wire before heating, or to an iron wire if platinum cannot be obtained; this will enable the operator to swill the article for a few minutes in the acid mixture, then swill it well in boiling hot water. Now make the acid mixture boil, and boil the article in it for a few minutes, then well swill again in the boiling water. It should now be free from blackness, and must then be allowed to dry, then plunged in the colouring mixture, moving it about therein for four or five minutes. It must then be swilled in clean boiling water, again plunged in the colouring mixture for one or two minutes, and again swilled in the hot water. Pour about a wine-glass of hot water in the mixture, and when it again boils, shake the article in it again for a minute and rinse in fresh hot water; it will then begin to show a fine gold colour all over. Finally, dip again in the mixture for a moment or two, and rinse well in fresh hot water, when, if the process has been properly performed on the right quality of gold, the surface of the article and the soldered joint will bear the tint of fine gold. The gold article must then be brushed with a scratch-brush in weak ale, well rinsed in hot water, and dried in hot boxwood sawdust.

Real silver articles must be similarly treated after being soldered; they should be annealed on a copper shovel to a dull red heat, then plunged into an acid mixture of one part sulphuric acid to forty parts of water made boiling hot in a pipkin. The silver articles are to be boiled in this, then rinsed in boiling water, and the operation repeated until the articles are white; they are then to be dried in clean hot boxwood sawdust and polished with plate powder. Imitation, and also very common, silver articles must be electro-plated after they are soldered. The method of doing this was explained in "Electro Plating at Home," in Vol. I. of this Magazine.

HINTS ON CANOE-BUILDING.

By A YOUNG AMATEUR.

As I have just finished a canoe somewhat different from the one described by the author of "Boat-Building Made Easy," I would like to say a few words on the subject of canoe-building, which I hope will be acceptable to the readers of AMATEUR WORK. My paper may be, and doubtless is, very imperfect, but as the practical hints contained in it are likely to be of use to some, I send it, hoping they and you will make allowance for any shortcomings.

In building my canoe, I wished to make her unsinkable, and also to design a simple and handy rig, in which the sails could be reefed and taken in from where the canoeist sits; but before I describe how this is to be managed, I will make some remarks on Mr. Kennedy's papers in Parts IV. and V. of this Magazine. The first thing is that, in speaking of the rabbet which is cut in the keel, he describes it as having merely a **T** form all along, whereas it is necessary to bevel the shoulder of the rabbet in order to obtain a tight fit, more especially towards the bow and stern. Fig. **1**, which shows the angle that the boards slope at in the bow and stern sections, will explain this, the half A showing the shoulder bevelled, the half B showing it as left in the **T** form. I think it is worth the little trouble that it takes to do, as the proper angle to bevel at can be found at the three places where the sections are fixed, and with these as a guide it is easy to finish the bevelling all along the keel.

The second thing which I will remark on is what he states in regard to the planking of a canoe, which is the most troublesome part of the building. In Part V. he says, "that from the shape of a canoe it is impossible for any single board, except the top one, to reach from end to end." Now, in building my canoe I did not find this to be the case. I determined to build the canoe with boards running from end to end, because it would be a stronger method, and also save a lot of trouble and time in cutting and jointing the boards. I have done so, and have not found any impossibility in it, though I must acknowledge that there was some trouble in getting the boards into their places, but this arose from not giving them a proper allowance for the sheer or rise of the canoe from amidships to the ends. There will, of course, be some waste in cutting the boards to the required curve, but this drawback is more than counterbalanced by the advantages of the continuous method of building. For a description of this and all other matters concerning boat-building, I would recommend the amateur to get Mr. Adrian Neison's book, "Practical Boat-Building for Amateurs." The articles on planking are very explicit, and I think amateurs will have no difficulty in comprehending them. Both FISHERMAN and H. S. (*Dover*) will find in them just what they want—the former, in the Canadian flat-bottomed bateau; the latter, in the canvas canoe on the model of a Canadian birch bark.

I will now explain how a canoe can be made unsinkable, with, if anything, less trouble than the ordinary method of building. In building a canoe, there are usually three sections, or bulk heads, as I shall in future call them, placed so as to divide the canoe into four equal parts. The use of these bulkheads is to furnish a framework or guide for the planking to be built round. They are only fixed in a temporary manner, so that when the canoe is sufficiently stiff they can be removed, and ribs put in their places as required. Now, instead of making the two end bulkheads temporary, we make them permanent by screwing the boards to them, and securing them to the keel, by knees or otherwise. We not only attain the desired end, but also simplify the building, for when the deck is screwed down on the curved top of the bulkhead, it completely shuts off the two end parts of the canoe from the middle part, and makes an airtight compartment of them. It will be better still if another bulkhead be placed at each end, midway between the one already spoken of and the bow and stern. So now, as a glance at Fig. 2 will show us, there are four air-tight compartments. Care should, however, be taken to prove that these compartments are water-tight before the deck is screwed on, and also to line the tops of the bulkheads with a mixture of white lead (dry) and gold size mixed to the consistency of putty. This will insure a water-tight joint when the deck is screwed down on it. This mixture ought also to be used in filling all seams and leaks, and if used in a conspicuous place, it should be coloured with a suitable pigment, to match the colour of the wood.

The use of air-tight compartments is that, if by any means the canoe becomes submerged or upset, the water could only get into the middle part of the canoe, and the remaining part, comprising the air-tight compartments, would give so much buoyancy that the canoe would be rendered unsinkable, and thus, almost without trouble, we have turned the canoe into a sort of life-boat. Waterproof air-bags made to fit the canoe are sometimes used, and they possess some advantages, being easily inflated or collapsed; but I prefer the bulkheads, as being easier to fit, costing almost nothing, and presenting greater security, their only disadvantage being that they limit the length of stowage, but a long spar like the mainmast can be carried on the stern deck, and if a paddle, jointed in the middle, be used, no inconvenience will be felt in this respect—certainly none that would counter-

balance the immense advantage which they give, enabling a canoe to live in rough water, if caught out from land. It must be understood, however, that these remarks only apply to a canoe when she is decked with a good wooden deck. It ought not to be less than $\frac{1}{4}$ inch in thickness when planed; if wood of thinner dimensions be used, it will require to be backed with canvas and marine glue. As regards the kind, mahogany would be the most suitable wood, but as it is rather costly, pine stained to imitate it would do. The main thing is to have it sufficiently strong, because it acts as a brace, binding the canoe firmly together; in fact, the strength of the canoe depends greatly on it. Again, it is obvious that it would not be worth the trouble of fitting air-tight compartments if they were only to be covered by such a slight protection as a canvas deck would afford. Though this latter kind might be light and suitable for a river, something more substantial would be needful for the sea.

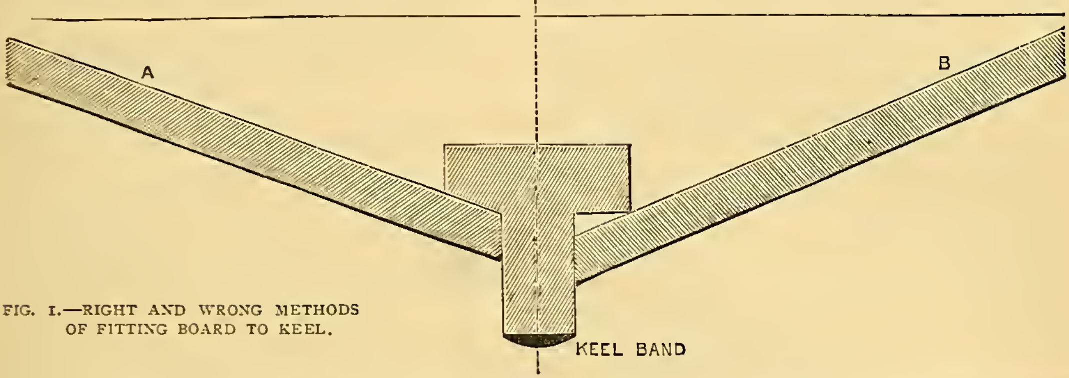


FIG. 1.—RIGHT AND WRONG METHODS OF FITTING BOARD TO KEEL.

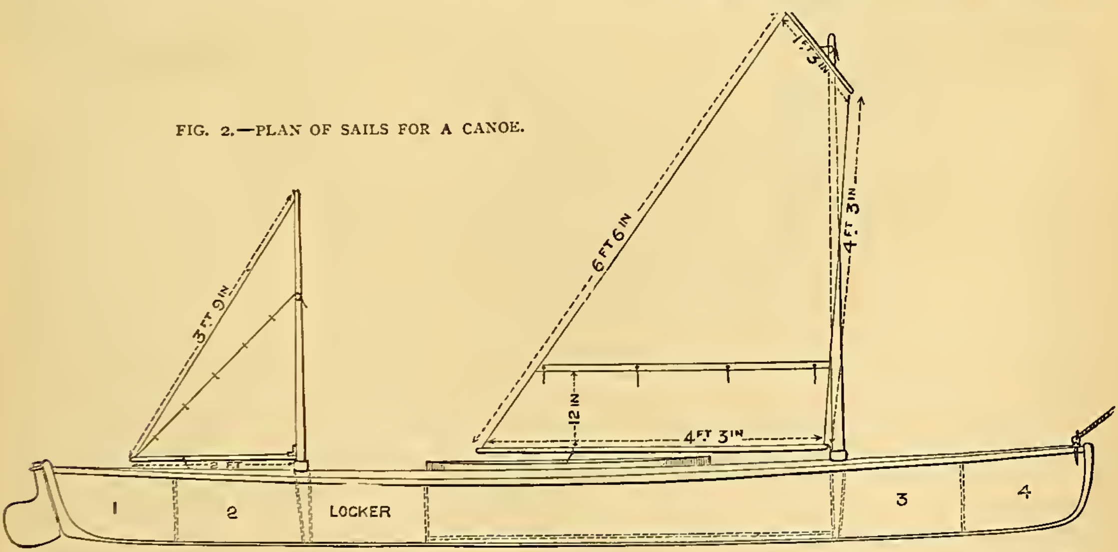


FIG. 2.—PLAN OF SAILS FOR A CANOE.

Before I go on to detail the sail plan shown in Fig. 2, I will make some remarks on the steering of canoes. Mr. Kennedy's plan is an excellent one, being very easily fitted, and also being handy to use. Of course, it is an advantage to be able to steer by the feet, and have both hands at liberty to handle sails or other gear, but as it is rather difficult to fit a foot-steering yoke properly, I think most amateurs will be content with the one described by Mr. Kennedy; but if any amateur wishes to fit one to his canoe—it must be done before the deck is put on—I will give a plan and description of one in some future number. The sail plan and measurements are shown in Fig. 2. The mainsail is worked by hooking on the boom to the ring in the mast (placed just above the mast socket). The yard is then hauled into position by the cord which passes through the blind-pulley in the mast, then down and through a pulley-block on deck just behind the mast, and from thence into hand, to be made fast to one of the cleats when the sail is set. There is only one line of reef-points shown, but

another can be added if required. The points are spaced 12 inches apart, and a piece of strong broad tape is sewn across the sail to stay it for their insertion. This should be done on both sides. In the mizensail, the cord which is shown passing across the sail is a double one, a part passing up each side of the sail through small rings spaced about every 12 inches. The two cords are united just where they enter the blind-pulley, from whence the cord passes into hand in the same manner as the mainsail halliard does. The use of this is, that if the sheet be loosened, and this cord hauled on, it will furl the sail tight up to the mast, from whence mast, sail, and all can be lifted and stowed below, if necessary or convenient. The boom in this case is a fixture, being joined to the mast by a piece of leather lashed to both, so as to form a hinge, which allows the boom to come up to the mast in furling. In the mainsail, a hook and ring is used, so that the boom can be detached from the mast and brought into the canoeist's lap to be reefed or to be stowed below.

The masts ought to be made the same size where they enter the sockets, so that, if occasion requires it, the mizen could be placed forward to act as a storm-sail. If the masts pass through the air-tight compartments, there will require to be made water-tight mast-boxes, which will come up flush with the deck, and over which the mast sockets will be placed. I would advise both of these to be put in square, as it will be less trouble to make them so, and the masts will be firmer in them. The object of these is to prevent any water getting into the air-tight compartments, which is the most important thing to guard against. If both of these are put in first, the mast can be planed to fit them accurately, so that no water can get into the mast-box itself, and this will make it additionally secure. The socket would, of course, be made of brass, and $\frac{1}{4}$ inch wood for the boxes, which should taper from the deck to the keel. The mast would be square up to the top of the socket, and from this rounded off in the usual way. I made mine $1\frac{1}{2}$ inch thick at the socket, tapering to 1 inch at the pulley and $\frac{1}{2}$ inch at the keel. The last thing to which I will call the reader's attention is by no means the least, namely, the apron. It will be found the hardest part of the canoe to fit satisfactorily; and as on it depends the comfort and safety of the canoeist to a great extent, it should be made and fitted carefully. I intend to fix mine permanently at one end of the well, and have a sliding board at the other end, so as to come up close to the body. This board will have side-pieces, to catch the macintosh cover and hold it down firmly; but in case of an upset, it would be easily freed by pressure from underneath. If the well is very long, a board should be fitted under the fore part of it. The breast-flap, for rough weather, when not in use can be rolled up and tied down on the sliding board. It only remains for me to state that I shall be happy to give any information in my power to the readers of AMATEUR WORK, through the medium of "Amateurs in Council."

WOOD-CARVING FOR AMATEURS.

By LEO PARSEY.

V.—HOW TO CARVE FRET-WORK—DESIGN FOR BOOK-COVER.

NEARLY all fret-work designs are greatly enhanced in appearance by being carved, and this method of ornamentation is deserving of every attention from the fret-cutter, as well as from the wood-carver.

There are, no doubt, many amateurs who are adepts at fret-cutting, and are yet unable to use, with effect, the wood-carver's tools; and it is to these especially, that I wish to point out the value of wood-carving, as a means of ornamentation, peculiarly suited to fret-work designs.

I know there are many who use the fret-saw also use a parting-tool and two or three chisels, to put in a few veins, or to partly separate the leaves in a foliage design; but this is not carving, although the effect of the work is frequently greatly improved by this simple method.

In some fret-work designs, especially in the case of intricate scroll-work, I do not recommend the introduction of carved work, unless it be simply a few incised lines to show the continuation of the scrolls; but in the majority of cases, particularly in foliage designs, the judicious and artistic use of wood-carving tools adds to the effect of the work. The amateur wood-carver who is unable to do fret-work is frequently at a loss, and is often put to great inconvenience in getting his designs fret-cut—indeed, fret-cutting and wood-carving should be studied together, as they are so dependent on each other. With few exceptions—such as panels and similar work—the wood-carver has generally to carve designs that have first passed through the hands of the fret-cutter. The best design for fret-work, intended to be carved, is foliage conventionally treated, and for brackets, letter-racks, picture-frames, and similar descriptions of work, designs of this kind are especially suited. I have given in Fig. 27 an easy design for a fret-cut and carved corner-bracket. The idea is a simple flowing arrangement of ivy leaves, both the arrangement and treatment of the leaves being of a conventional nature. I have chosen the ivy-leaf, as being more readily carved and affording more scope, for a beginner, in the treatment of the leaf,

than a more complicated pattern would allow. In fact, the ivy-leaf always looks well when carved, either naturally or conventionally. I have simply sketched in the idea of the design, and do not give it as a pattern to be faithfully followed in every detail; it is, in reality, more of a suggestion, to be altered and improved upon by the amateur himself, than a finished design to be slavishly copied. The shelf is ornamented by a simple carved bead-moulding only, as shown in Fig. 28. In Fig. 29 is seen a sketch of a similar nature, and suitable for a similar purpose, but of a Gothic design. Both these designs could be adapted to other uses, or instead of corner brackets could be used as ordinary wall-brackets. Owing to the limited space at my disposal I have drawn these designs on a reduced scale, and have only shown a portion of the bracket, but they can easily be enlarged to any extent. With respect to the best kind of wood

FIG. 27.—DESIGN FOR FRET-CUT CARVED BRACKET

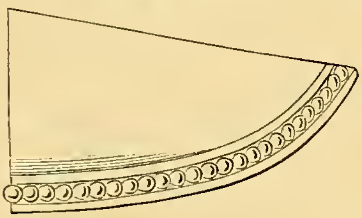


FIG. 28.—PART OF SHELF OF BRACKET IN FIG. 27.

FIG. 29.—DESIGN FOR GOTHIC BRACKET.

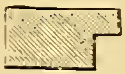


FIG. 31.—SECTION OF FRAME SHOWING REBATE.

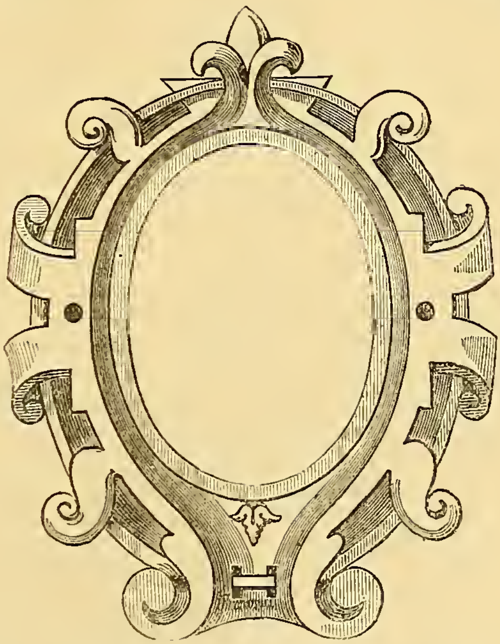


FIG. 30.—SMALL OVAL FRAME IN ELIZABETHAN STYLE.

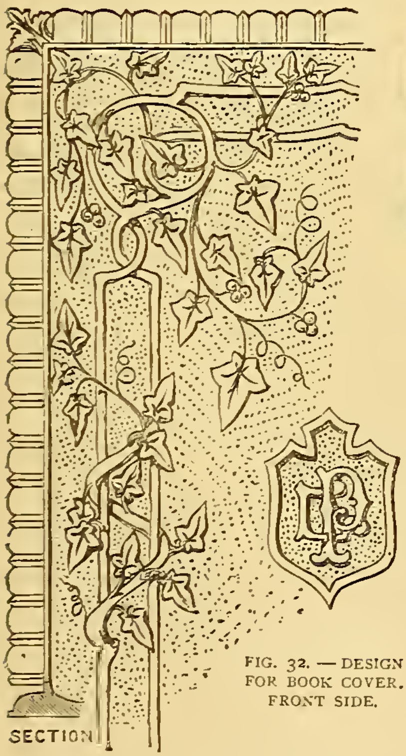


FIG. 32.—DESIGN FOR BOOK COVER. FRONT SIDE.

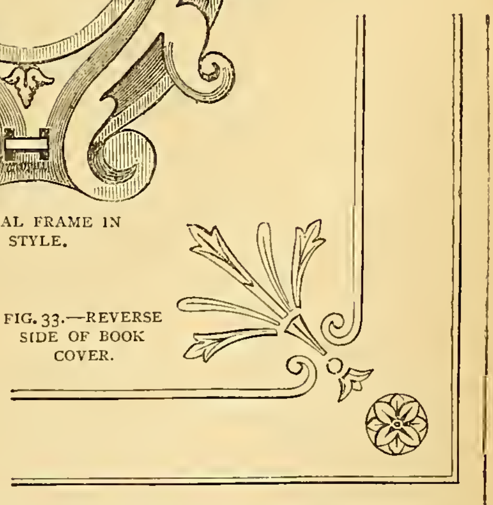


FIG. 33.—REVERSE SIDE OF BOOK COVER.

to be used, I should suggest American walnut-wood for the ivy-leaf design, and stave-oak for the Gothic, if the work is to be left plain or polished; but if it is intended to be gilded, then nearly any description of wood will do.

After deciding on the kind of wood to be used, the next thing will be to settle the thickness, and unless it is desired to have the brackets very boldly carved, $\frac{3}{8}$ inch will be thick enough. I am concluding, of course, that the brackets are to be of a medium size only, and not placed too high. The wood, after being smoothly planed and fitted, should be fret-cut, and all irregularities of outline rectified with the carving tools, neither sand-paper nor files being used for this purpose.

After this has been done, glue down the work on a piece of deal, inserting between the deal and the side of the bracket a piece of brown paper, the object of which is to allow the bracket to be easily taken up when the carving is finished. The design is then roughed or blocked in and the shape of the leaves shown, and when this has been done the design is again gone over and finished off in every detail, the veining of the leaves being left to the last. The bracket is now ready for taking up, and to do this without running the risk of breakage, a knife with a thin blade should be inserted between the deal and the bracket, and the latter can be carefully detached. The glue should then be taken off the back by holding it above the flame of a gas-burner or a candle, at such a height as to allow the heat to bring up the glue in blisters, which can then be scraped off. In order to avoid the appearance of the thick edges of the stem and leaves, the back of the bracket requires to be chamfered or rounded off to a feather edge, and when this has been done it only remains to permanently put the bracket together. If an ordinary wall-bracket is desired, care must be taken, before carving the front pieces, to draw a line down the centre, as this piece requires to be carved on *both* sides, and the carving must be equally balanced. It will be found rather awkward to hold this piece of wood firmly after one side has been carved, but a little ingenuity will soon overcome the difficulty.

In the case of Fig. 29, a different method of treatment has to be followed, as the Gothic style consists essentially of "rounds and hollows," and it is difficult to describe exactly how this is done. The centre of each leaf in the trefoil is formed like a ball and surrounded by a hollow. A single vein, which in Gothic work is almost invariably cut with the parting tool, is run down the centre of each leaf. The stems require to be treated so as to give a rough rustic-like appearance, as seen in the design.

The amateur will gain much useful knowledge in the treatment of this description of work, and may obtain many hints by carefully noting any specimens of Gothic work that he may see, and nearly every church contains more or less elaborate examples of Gothic wood-carving.

The next sketch, Fig. 30, is a design for a small oval frame in the Elizabethan or strap style. This design is also reduced in size and only half of it shown, the other half being an exact counterpart. Walnut-wood or oak of a close and even grain will be the best wood to use for this frame, and it should be at least $\frac{3}{4}$ inch thick, to allow of bold effects of light and shade being obtained in the carving. The outline requires to be fret-cut, and when this has been done, the oval centre being also cut out, carefully regulate the outlines by means of the tools and a wood file, and especial care should be given to obtain a perfect oval centre. Mark off the rebate, which should come to within about $\frac{1}{4}$ inch of the front of the frame, and extend back about $\frac{3}{8}$ inch, as in the section shown in Fig. 31. Cutting out the rebate in the solid wood, as above described, is much better than forming it by gluing on strips of thin wood or making a separate frame, and this will be found suitable to all carved frames. The rebate is simply made, by first of all cutting away the spare wood down to the marked lines, and then finishing off with the parting tool and either a very flat tool or a "firmer." The best way of holding the frame, when cutting out the rebate, is to glue it *face* downwards on a piece of deal or soft wood, not forgetting to use the brown paper.

After the rebate has been made, glue down the frame again, and mark out the principal lines of the design on the face of the frame. Then cut in roughly with a hollow tool the principal features of the design, taking particular care to set in the inside moulding correctly, and afterwards proceed to finish off in the usual manner, beginning at the top of the frame and working down, carefully balancing each side, and seeing that the height of one side is the same as that of the other. This design is intended to represent the strap work so freely introduced into the Elizabethan style, and looks very effective when boldly carved. The surface is everywhere left perfectly smooth from the tools, and the edges of the frame are chamfered from the back. The amateur will find far more difficulty in carving this design effectively than he has hitherto found in the conventional foliage examples previously given.

I will give one more pattern in foliage work, and then refer briefly to the difficulties to be encountered in Italian foliage, natural and grotesque animal forms, and the human figure—this last being the most difficult of all. Figs. 32 and 33 are suggestions for a cover of a book or blotting-case, and represents a conventional

arrangement of ivy-leaves surrounded by a carved moulding, and with a shield in the centre for monogram or crest. It is intended to be carved in either boxwood, lime-tree wood, or fine-grained American walnut-wood. Before commencing the carving, it will be necessary that the corners are perfectly square; by this I mean, that the angles are right angles, and the object of this is to allow the cover, when finished, to be properly bound. The wood should be about $\frac{3}{8}$ inch in thickness for the front, and about $\frac{1}{4}$ inch thick for the reverse side. These carved covers are, in binding, inserted into a sort of panel, and books or blotting-pads, suitable for carved sides, require to be specially made. The best plan is to send the sides when carved to a practical bookbinder, or to any of the well known fancy warehouses. Messrs. Parkins and Gotto, of *Oxford Street*, I know, execute this kind of work at a reasonable price, and in an artistic manner. The reverse side does not require to be so elaborately carved as the front, as it is not much seen, and I prefer either to leave it perfectly plain or else to simply incise a few lines, as in Fig. 33. These lines are cut in with a parting tool principally, every part of the pattern being V-shaped. Instructions for incised work will be given later on. This design, like the others, can easily be enlarged to suit any sized book. The general working and treatment of this pattern will be in every respect similar to that described by me in the February number of AMATEUR WORK, and the groundwork can either be punched or left plain at the descretion of the amateur. I would, however, call attention to the veining of the leaves. Of course, in natural ivy-leaves there are five principal veins with innumerable smaller veins branching out from them, but in carving it is sufficient to show the principal veins *only*, and for variety some of these may be left raised—as in the natural leaf—and the others cut in with a very small veiner. The tendrils shown in the sketch are simply intended to be incised lines only, and not carved in relief like the rest of the design. The moulding round the outside of the cover is sufficiently defined in the illustration, and needs no explanation. When finished, the front cover will look best if the bands round the outside of the carved work and the shield are polished, and the remainder of the work left dull, a little boiled linseed-oil being applied and well brushed in with a hard brush. The reverse cover should be brightly polished, the incised lines alone being left dull; to prevent this surface being scratched or defaced in any way, small projecting buttons or pateras are often inserted at each corner, but they should not project more than $\frac{1}{16}$ inch, just sufficient, in fact, to prevent the surface of the side coming in contact with the table. These pateras can be turned out of ebony and attached to the cover. If preferred, the incised lines can also be black, but, for my part, I think they look better when left of the natural colour of the wood. I had intended to devote this article to ebony-carving and incised work, but I think my readers will be better able to enter into these branches of the art after they have executed some of the designs given in the present paper, and I will therefore reserve these subjects for my next article.

(*To be continued.*)

HOW TO CONSTRUCT A VIVARIUM, OR INSECT HOME.

HAVING seen amongst the "Information Sought" an inquiry from a reader with regard to a plan of a Vivarium, and believing that the details of construction of such an article have not hitherto been published in any Amateur's Journal (if at all), I am induced to send particulars of one which I have constructed, which will, I think, exactly suit the querist's requirements, and perhaps also be acceptable to many other amateurs.

I should mention that the design is not my own, but is taken from a work by H. Noel Humphreys, published in 1858, entitled "The Butterfly Vivarium, or Insect Home," and from which I have drawn liberally for the description and plan, as I believe the publication is now out of print. If, however, this book could be referred to, much valuable information would be gained as to the successful management and keeping of this little Insect Home.

With some slight modifications and additions, I have strictly followed the directions given in the work referred to (p. 14); and, as the structure is composed mainly of zinc, its construction is well within the scope of AMATEUR WORK, especially having regard to the articles on Soldering which have appeared in recent numbers of this journal. I shall not, therefore, dwell upon matters which have already been fully dealt with, but request those who may be desirous of making this vivarium to read well and inwardly digest Mr. Edwinson's valuable articles on Soldering (Parts XII. and XIV.), as upon the skilful use of the soldering-iron the success of this little building entirely depends, all the joints being soldered together.

Fig. 1 is a front view of the vivarium, of a form somewhat similar to that of a fern-case, and being intended for rearing aquatic as well as land insects, a portion of the interior is set apart for a small reservoir of water, starting from the front angles of the case and curving backwards in the form of a little bay. The water-tight separation forming this little reservoir

consists of a piece of sheet zinc of the necessary height. It is soldered to the bottom of the vivarium, which is also formed of zinc; and up the front angles it is equally soldered to the zinc uprights or columns. The reservoir has, therefore, its back and sides formed of zinc and its front of glass. The semicircular course backward of the water division is intended not to extend above half the depth of the vivarium, even at its furthest point, in the centre, so as to leave ample space for the land arrangements, which, in the two back angles, will thus form a considerable space. At the sides and back, the vivarium is to be of zinc up to the height of the joint just above the water level, which is shown in Fig. 1. And at this point the whole of the upper part or cover of the vivarium is intended to lift off, for cleaning purposes, etc. The upper portion will be made to fit tightly to the lower by sinking into a deep groove, extending round the whole joint. At the *sides* of the structure, joining both back and front columns, a broad strip of perforated zinc will be attached, for ventilation, which will form the framework to a glass door, affording easy access to all parts of the vivarium, and entirely occupying the rest of the space above the solid zinc, which will reach up to the joint, as before stated. The lower part of the glass door will, therefore, be on a level with the surface of the land arrangements, and will reach to the top of the square portion of the frame from which the roof springs. Fig. 2 is a view of the side, showing the door in position; the opposite side will be the same, except that the glass portion need not be made to open, as another door would scarcely be necessary. The little gallery at the crown of the roof is also of perforated zinc. Figs. 1 and 2 are drawn to scale, one-eighth size.

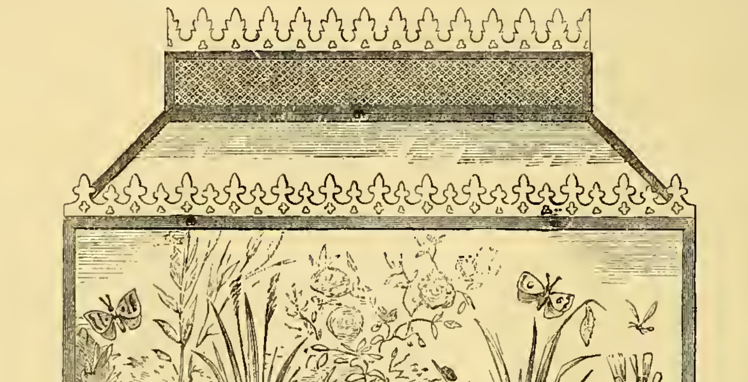


FIG. 1.—FRONT VIEW OF VIVARIUM.

So much for the description, which is taken, almost verbatim, from Mr. Humphreys' interesting book. Now let us consider the construction more in detail, and the materials employed therein. All the corner uprights or columns, including those of the little gallery, are of angle zinc, a section of which is shown in Fig. 3. The bottom bars of the framework of both the upper and lower portions of the case are of this kind of angle zinc; and so also are the lower bars of the little gallery. All the remaining parts of the framework are of angle zinc of the section shown in Fig. 4. I have marked these as "No. 1" and "No. 2," for convenience of reference hereafter.

Commencing with the lower portion of the case, proceed to construct the framework for the glass, which I may mention here is a piece of plate-glass a quarter of an inch thick. We shall require a length each of Nos. 1 and 2, of 27 inches, and two short pieces of No. 1, of $7\frac{1}{2}$ inches. The ends of these pieces should be mitred, as shown in Fig. 1, and then soldered together. (I cut mine with an old tenon saw in a mitre box, and found that very little filing was required to make a perfect joint.) In arranging the bars for mitring, be careful to keep the jointed part of the No. 2 zinc (see A, Fig. 12) underneath, so as to allow the upper portion

of the case to fit as closely as possible. The back of the lower portion is of precisely similar framework, and in this may at once be fitted a sheet of stout zinc cut to the exact inside measurement, the edges being soldered to the angles all round, in order to make the joint water-tight. Next cut two pieces of No. 1, 16 inches long, and connect the bottom corners of the back and front frames with these; two similar lengths of No. 2 being joined to the top corners will then complete this part of the framework, the portions which form the ledge on which the upper case rests being also mitred and soldered underneath. Fig. 5 is intended to represent this rectangular frame, with the back piece of zinc in position. Two sheets of zinc may now be cut and soldered into the sides in the same manner as the back, leaving the glass for the front till a later stage.

The bottom of this lower portion is a sheet of zinc 30 inches by 19 inches, and to this the framework just completed must be soldered all round, *on the outside.* It will be noticed upon inspection that the corner of the angle zinc is slightly rounded; this will therefore form a small gutter for the solder to run in, and allows of a very strong but neat joint being made. There will then be a margin of $1\frac{1}{2}$ inches, $\frac{3}{4}$ inches of which is intended to be bent down at right angles to the base, as shown in Fig. 1, and the corners soldered together. This operation may be facilitated if the marks are indented or scratched with a sharp-pointed nail, or other instrument, the small square at each corner being cut away before bending. See Fig. 7, which shows the sheet marked and cut ready for turning down.

FIG. 10.—ZINC STRIP FOR BED OF ROOF

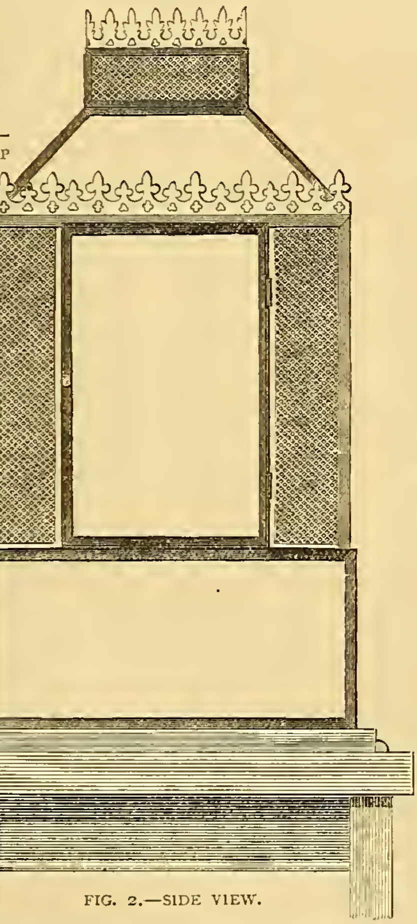


FIG. 2.—SIDE VIEW.

FIG. 3.—CORNER UPRIGHT SECTION (No. 1).

FIG. 5.—RECTANGULAR FRAME WITH ZINC BACK.

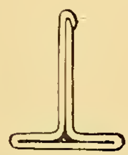


FIG. 4.—ANGLE ZINC (No. 2).

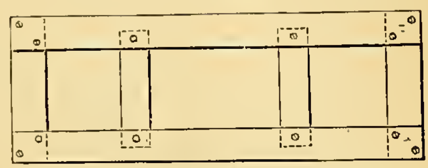
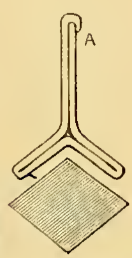


FIG. 6.—FRAME TO RECEIVE ZINC BOTTOM.



Piece of Iron.

FIG. 12.—FORMATION OF ZINC CORNER BAR.

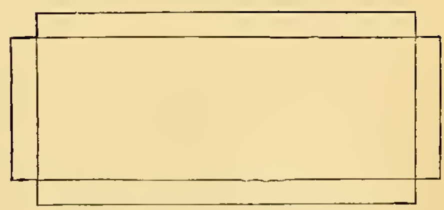


FIG. 7.—ZINC CUT TO FORM BOTTOM.

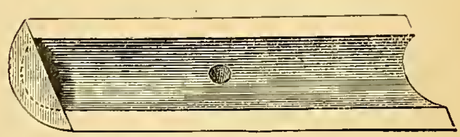


FIG. 8.—DRAIN PIPE.

Fig. 6 is a frame of wood which forms the base on which the zinc bottom rests, and, indeed, the bending process may be performed upon this frame. It is 2 feet $4\frac{1}{2}$ inches by $17\frac{1}{2}$ inches, and is composed of strips of $2\frac{1}{2}$ inch wood 1 inch in thickness; the ends may be either mortised, or halved, together, and the two middle supports inserted in a similar manner. It will be obvious from what will be described hereafter, as to

drainage, etc., why this framework is used in preference to a solid board.

We now come to the division which forms the reservoir. This is of zinc, as high as the ledge on which the upper portion of the case rests, and for purposes of strength and neatness it should be previously folded down at the top to the extent of half an inch. It has been already mentioned that the central part of this should not extend beyond half the depth of the vivarium. The simplest way of determining the length of zinc necessary for this partition will be to cut a piece of thick cardboard to the size and shape required to fit the bottom of the intended bay, and to bend the zinc to fit the arc of this card template. Do not destroy the card, as it will serve for a guide when fixing the division to the bottom. Assuming that you have now cut this semicircular boundary to the proper height and length, solder one of the ends to the front angle of one of the uprights. Now insert the glass (which should be about a quarter of an inch less than the full inside width measurement, so as to allow a little play, in order that you may be able to get at the other end), and finish soldering to the bottom and the other upright. The glass may be left out until the soldering of the division is completed, if desirable, and in one respect it would be an advantage, as it might be cut to the full width, but if this course is adopted the top bar of the frame will have to be removed to enable the glass to be inserted in its place. The division should be soldered to the bottom on both sides; that is, in each compartment. A piece of $\frac{3}{8}$ inch zinc tubing should also be fixed horizontally between the top of this division and the back, just below the centre of the ledge, to give greater strength, and this, with the exception of the drain pipe, which I will now describe, completes the soldering work to this portion of the case.

It is very material that the land arrangement should be properly drained, and the method which I have adopted is very simple, and gives great satisfaction both as regards utility and cleanliness. *Underneath* the case, from the middle to the back edge, I have fastened a bent piece of zinc about an inch in width and half an inch in depth, something like an ordinary U roof drain-pipe, and to the centre of this I have connected a short piece of pipe and a small brass stop-cock. In the bottom of the case over this drain-pipe I have pierced a row of $\frac{1}{8}$ inch holes, and over these holes placed an arched strip of perforated zinc. The floor of the land portion is covered with Portland cement, tapering downwards from the sides to the centre, and on this cement a stratum of about 3 inches of cinders and broken crocks is laid. Fig. 8 represents the drain-pipe, one end of which is closed with a semicircular piece of zinc, the other end being soldered to the edge at back. Fig. 9 shows this drainage system in section: A A, cement; B, perforated zinc; C, drain-pipe; D, stop-cock; E E, cinders and broken crocks; F F mould; H, holes in floor. It will be necessary to cut away the base-board to fit over the part of the drain-pipe which is joined to the edge.

The glass is secured to the front by means of the following cement: Equal parts of red lead, white lead, and litharge mixed with boiled oil into a paste of the consistency of putty. This is a well-known cement for purposes of this kind, and as it dries rather quickly, should only be mixed as required for use. The glass should be well bedded in with the mixture, and pressed as closely as possible to the framework. It will then be advisable to let the case remain undisturbed for at least twenty-four hours, so that the cement may thoroughly harden, or you may look out for leakages when the water is poured in. The bed of the little lake should be covered with Portland cement to a depth of $\frac{1}{4}$ inch, and the back entirely covered with it. Small portions of broken flower-pots may then be laid on to the back, and roughly coated with cement to imitate caves and rockwork, letting the cement run and hang in drops. This will be found to be very effective, the whitish cement helping to light up the water of the little bay, which should be turned away from the window of the room in which the vivarium is kept.

If it is desired to construct a fountain in the lake, the pipes should be soldered in before laying the cement, and this, and the drain-pipe, is what I had in view when dealing with the base-board. In the case which I have constructed I have inserted a pipe in the centre of the lake (soldering it round on each side of the bottom), built round it a rockery of small flower-pots coated with cement, and connected this rockery to the back of the tank, thus forming a sort of archway. I had intended to work this fountain from a glass tank concealed in the gallery at the roof, using the strengthening tube I have referred to as an overflow-pipe, and connecting it from the outside with the drain-pipe. I have not, however, completed this arrangement, and cannot, therefore, say if it would answer. It would certainly interfere with the free removal of the upper case; however, I suggest the means of application within the dwelling itself, if any one should think a fountain indispensable.

The framework of the upper portion of the case is built in the same manner as that of the lower portion; but as this is somewhat complex, it will be better to proceed by steps, and complete the large rectangular portion before commencing the roof.

As this upper portion is intended to fit closely into the lower portion, proceed to cut the bottom bars

accordingly from No. 1 zinc. The height of these columns should be 14 ins., also cut from No. 1. Having mitred the four columns and bottom pieces, cut four pieces of No. 2 to correspond with the bottom bars; and it will be as well in this case to take the sides first, as the inner columns and perforated zinc can be added before joining the front and back bars. These inner columns are of No. 2, and are as long as the inside measurement of the frame, the front part of each end being filed away down to the tongue (if that is a correct term), so that the columns may come flush with the outer faces of the frame. A glance at Fig. 2 will doubtless assist, if I have not made myself sufficiently explicit; the joint outside will be neatly soldered, and also each side of the tongue to the inside of the framework. Both sides of the case, so far, are alike, and the four pieces of perforated zinc may be fitted; a few touches of solder here and there will suffice to keep them in place. I ought to have mentioned that these inner columns should be fixed at their respective corners, so that from corner to column the outer measurement will be 3½ inches each, thus leaving a central space of about 9 inches, for in one case a window, and in the other a door. The construction and fitting of the door will be subsequently explained. Proceed now to attach the back and front bars to the sides, and at about five inches from the top corners of the upper front and back bars solder two strengthening tubes. (The black dots in Fig. 1 indicate the positions of the tubes, though, of course, they are inside the framework.) These tubes may be a trifle longer than the distance the inside ledges are apart, the ledges resting in a small nick filed across the ends of each tube. In addition to imparting strength to the framework, the tubes will be found convenient rods on which to hang small flower-pots and baskets for trailing plants.

The gallery should next occupy attention. This is 18½ inches long, 7½ inches broad, and 2½ inches high. The four small columns and the lower bars of the frame are of No. 1; the remaining bars are of No. 2. Not much difficulty will be experienced in constructing this, if the front and back frames are first made, and the side bars joined up to them. Each frame is fitted with perforated zinc, and across the centre of the lower ledges a piece of tube is attached, as before explained (see Fig. 1). Underneath all four lower bars, strips of zinc, about half or five-eighths of an inch broad, and bent to the angle, as shown at A, in Fig. 10, will have to be soldered to form a bed for the glass which forms the roof. The ornamental fringe round the top of this gallery may now be added. It is fitted inside the top, and soldered to the outer edge of the frame. Whilst soldering, keep the fringe pressed tightly to the frame with a piece of wood, as it has a tendency to shrink away from the soldering-iron.

Now we approach what (if anything) may be deemed to be at all difficult throughout the whole structure, and this is the fixing of the corner bars which connect the gallery with the upper portion of the case, so as to make the roof at all ship-shape. But a little patience, and the employment of the simple appliances I am about to describe will enable us to surmount the difficulty. Cut six pieces of stout zinc (the stouter the better) each 6½ inches long, and an inch or 1½ inch wide. Solder two pieces outside each of the front and back bottom bars of the gallery 2 inches from the ends, and one piece in the centre of each of the side bars. Be sure that these strips are all of the same length. You will then have the gallery mounted on what I may call six legs, each 6 inches long. Now bend each of the legs carefully outwards from the soldered joints until the ends of the opposite pairs are of the respective distances of the inside width and breadth of the upper portion of the case. Let the ends rest right in the corners of the angle bars (I do not mean the four corners of the case), and fasten them with a touch of solder. Fig. 11 is a plan of the two frames, showing the position of these strips, numbered 1 to 6; and if you have been exact in your measurements, the roof will be in its proper position and ready to receive the four corner bars which form its ultimate means of support. These are also indicated in the plan as well as the three tubes before referred to.

The four corner bars are of No. 2 angle zinc, *about* seven and a-half inches long, bent in the vice with the aid of any square piece of iron, to the section shown in Fig. 12, so as to form the sides of the bed on which the glass roof rests. You will not find this a difficult job if a little care is exercised, and the joint shown at A, Fig. 12, previously soldered. It will be better to perform this bending operation before the exact length is cut, as each end has to be bevelled off to the proper angle, and therefore it will be wise to allow a little extra length, in case the cut first made should not be exactly true. The bevels are, of course, parallel to each other, and the extremities of what I have previously called the tongues of the bars, should be flush with the lower corners of the little gallery and the inside angles formed by the frame of the upper portion of the case respectively (see Fig. 11). To lessen the difficulty which may possibly occur with regard to these bevels, I would suggest that a stick of triangular wood should be cut and fitted as a pattern, the position and weight of the roof making it plainly apparent that good joints are needed at these corners. Use extra care in soldering these joints; then, when the bars are properly secured, unsolder

the six strips of zinc, and remove all traces of their positions. The crest-work round the upper portion of the case may now be affixed in a similar manner to that already described. If desired to further beautify the case, four ornamental spires may be obtained, and soldered to these four corners.

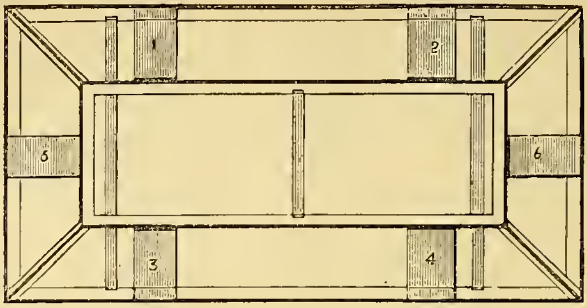


FIG. 11.—PLAN OF FRAMES TO FORM TOP.

The door in the side next demands attention. This is a very simple affair ; four pieces of No. 2 are cut so that the tongues fit the opening in one of the sides, mitred at the corners, and soldered together. I have the door on the right hand side from the front. Fig. 2 shows the door in position. For hinges, two pieces of bent iron wire are soldered to the right inner column, and two small pieces of zinc are bent round to fit these wires easily, and soldered on to the outside of the door. This arrangement allows of the door being entirely removed, though, if preferred, small brass hinges may be fixed instead. Plenty of solder may be used in this operation, the surplus being trimmed off with a file and the edges squared up. The fastening for the door is simply a small piece of wire bent to a right angle, which works in a hole bored through the frame of the door, a small brass knob being screwed or soldered to the end of the wire close up to the frame. The hole in the door should be less than the diameter of the wire, and the portion of the wire which works in the hole filed down to fit, thus making a kind of collar, of course leaving a sufficient depth for the angle piece to catch the inside of the left inner column.

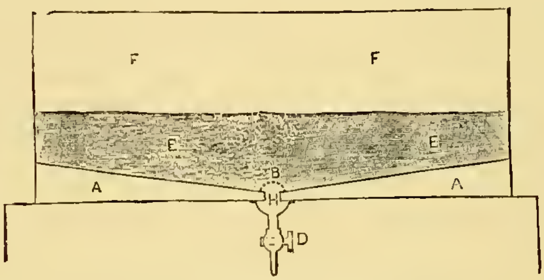


FIG. 9.– DRAINAGE SYSTEM IN SECTION.

It is unnecessary to describe the glazing process ; putty, or the cement used for the plate glass in the lower portion, may be employed, and it gives a neater appearance to the vivarium if the framing round the perforated zinc at the sides is filled up with putty, and smoothly bevelled off. The top square of glass need not be fixed ; it will lie flat on the top ledges, its removal being found very convenient at times, especially when cleaning the slanting panes of glass.

The materials for construction of the metal portion of the building may be obtained at any zinc works. I may perhaps mention, without attempting to advertise, a well-known firm, Messrs. Braby & Co., *Euston Road*, who supplied most of the materials for my case, and in whatever quantities I desired.

The painting may be according to taste ; almost any colour will look well. Mine is French grey picked out with gold, but bronze green and black are the colours mostly used for fern-cases and aquaria. The inside should be painted with a light colour. I experienced great difficulty in getting the paint to adhere properly to the zincwork, and should have been glad to have known at the time of a wrinkle which I fancy I have lately seen in our Council columns, to the effect that zinc, before painting, should be scored *in one direction* with sand-paper, so as to form a series of minute parallel ridges.

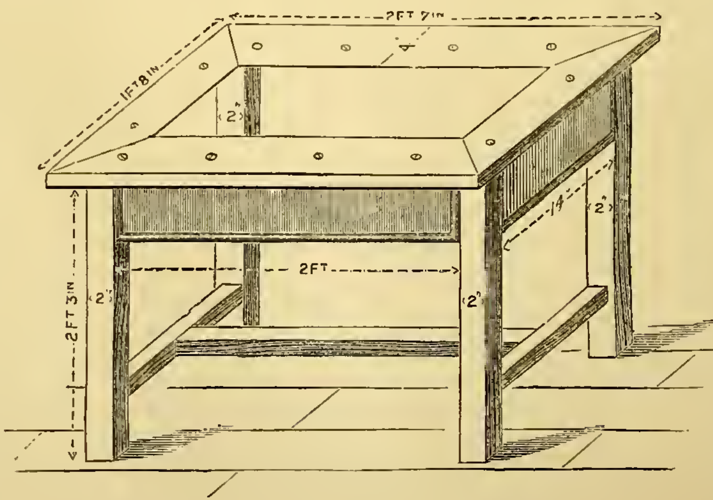


FIG. 13.—STAND FOR VIVARIUM, WHEN COMPLETED.

Fig. 13 is a rough perspective view of the stand. It will be found that the vivarium, when furnished, will need a tolerably strong support to sustain its weight, and this stand, though not very elegant, is certainly strong, and answers its purpose very well. The legs are 2 inches by 1½ inches, 2 feet 3 inches to 2 feet 6 inches will be quite high enough. Four top rails, or panels, 2½ inches deep, and 1 inch thick, are mortised into the tops of the legs, being set back half an inch. Two side rails, 1½ inches square, are also let into the legs four inches from the ground, and connected by a stretcher bar also 1½ inches square. The legs, side rails, and stretcher bar should have their edges chamfered, and a flat piece of moulding is nailed under each of the panels between the legs. The top is composed of pieces of board 4 inches broad and 1¼ inches thick (the ends being mitred and glued together) screwed all round to the tops of the panels. This permits of easy access to the drain-pipe, and lightens the stand without affecting its stability. All the mortise joints should be glued and secured with wooden pins.

The stand may be painted the same colour as the vivarium, and four pieces of small ornamental moulding nailed round the top close to the case will cover the edges of the zinc, form a relief to the square angles, and keep the case in its proper position on the stand.

In arranging the land portion of the case, it is necessary when filling in the mould to sink certain tin or zinc tubes for the purpose of concealing small bottles of water, in which the stalks of the plants required for the food of the insects may be plunged, in order to keep them fresh ; but this is rather away from the vivarium construction, and, for the stocking and successful rearing, etc., I must, therefore, refer the reader to the authority I have already quoted, to which I am so largely indebted for the subject-matter of this article.

I have now done; and hope that what I have written may be of service to the readers of AMATEUR WORK, in assisting them to construct for themselves an article which is well within the powers of most amateurs, and which, when completed, will afford them gratification and delight—gratification, from the fact that such a handsome building is the result of their own handiwork, and delight, possibly, in the pursuit of the interesting study of insect life, which the possession of such a "Home" enables them to follow.

As an amateur, and writing for amateur workers, I have endeavoured to steer clear of technicalities ; and, in doing so, my inexperience in writing has led me to use a certain amount of tautology, for which, I trust, I shall be graciously pardoned. I shall be most happy to answer, through the medium of "Amateurs in Council," any questions which may arise through possible errors on my part, though I hope I have been fortunate enough to have escaped from committing to paper any serious inaccuracies which might have the effect of misleading any readers instead of guiding them aright in the work I have endeavoured to place before them.

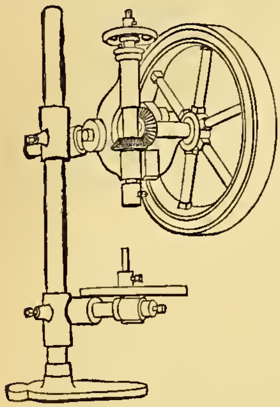
NOTES ON NOVELTIES.

MESSRS. R. MELHUISH & SONS, of 85 and 87, *Fetter Lane, E.C.*, have supplemented their useful catalogue of tools and appliances used in carpentry and joinery and the building trades, by another of ironmongery of all kinds, which will be found equally useful by the amateur. This catalogue forms a very complete price-list wholesale and *retail*—a matter of the highest importance to the amateur who does not require to buy all kinds of ironmongery by dozens—of shelf and wall-brackets, locks and door furniture of every description, axle and frame pulleys, hat and coat pegs, and hooks, nails and screws of all kinds, castors, drawer-handles, ornamental brackets and hinges, desk-fittings, blind furniture, window-catches, rack pulleys, casement fasteners and stays, and the thousand and one items and oddments of various kinds that almost every amateur is sure to be wanting at some time or other. As the catalogue is thoroughly comprehensive and is, I believe, unique of its kind, all amateurs who dabble in carpentry and joinery, and do their own repairs at home, should provide themselves with it. No price is marked on it, but it is given gratis to customers; and to those who send for it by post I suppose it would be supplied at 6d., the price charged for Messrs. Melhuish and Sons' Price List of Tools, etc. Catalogues of this kind cost no small sum to compose and print, and we cannot expect them to be given away wholesale to all applicants.

I have to acknowledge the courtesy of Mr. Norwood Earle, 80, *Cannon Street, E.C.*, in sending me particulars of several of Hodson's Patent High Speed Expansive Rotary Engines, manufactured by the Thames Iron Works and Shipbuilding Company (Limited), recently on exhibition at the Royal Aquarium, Westminster. These engines are expressly adapted for driving dynamo-electric machines. I do not think that amateurs are likely to purchase engines of this kind, as they are beyond their requirements. I have pleasure, however, in referring any of my readers who may be curious about them to Mr. Earle, and to say that their price ranges, according to size and power, from £45 for two-horse power to £240 for forty-horse power.

Mr. James Henry Makin, Engineer, *Cupola, Gibraltar Street, Sheffield*, wishes me to call attention to his drilling machines, which I have much pleasure in doing, because they seem to be in every way calculated to do good service to those amateurs who may determine on providing themselves with one or the other of them. Of these machines there are three kinds, or rather sizes, determined by their capability, and numbered 1, 2, and 3. All of them are adjustable, may be worked by hand or by power, and will bore at any angle

and to any depth. The smallest of the three, known as No. 1, will not bore a hole larger than ½ inch in diameter, and is sold at £1 12s. No. 2, of which an illustration is given in Fig. 1, will bore holes up to 1 inch in diameter, and is sold at £2 15s. No. 3, which is shown in Fig. 2, will bore holes up to 2 inches in diameter, and costs £3 15s. This drill, as may be seen on reference to the illustration, is provided with gearing, and is so made that by simply moving a catch at the top it can be thrown in gear, so as to get *great power* with *slow speed* for large drills. Another movement of the catch will throw the machine into gear for giving *great speed* to small drills. The engravings will fully indicate the character of the drills and their mode of working. Amateurs should send to Mr. Makin for his circular, which includes many useful and essential tools and appliances for lathe work at moderate prices.

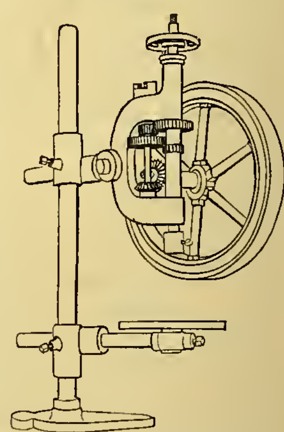


MAKIN'S DRILLING MACHINE FOR AMATEURS, NO. 2.

We have heard a great deal of "Louis" Velveteen as a material for ladies' dresses; but it appears that it is equally useful for upholstery and artistic decorations, and forms a good substitute for plush. It may be used as curtains and to form table-covers, or a backing for fretwork and to cover frames for looking-glasses, plaques of painted porcelain, etc. Bookshelves and brackets for the reception of bric-à-brac may be covered with it, and ottomans, sofas, chairs, etc., look well when upholstered with it. For minor purposes, such as mounting for screens, valance boards, mantel-boards, and even for covering panels to be set in frames, forming doors, etc., it is most valuable. It may be had in a great variety of shades and colours, and, being a really cheap material, especially when its rich and beautiful appearance and durability are taken into account, it may be used with economy and advantage for all kinds of artistic decoration. It may be purchased of most drapers, being a material which is well known, having now been before the public for many years. Every yard of the genuine "Louis" velveteen is stamped on the back with the word "Louis."

Messrs. Charles Churchill and Co., American Importers, 21, *Cross Street*, *Finsbury*, *E.C.*, have recently added many novelties to their extensive stock of tools and appliances, some of which will be described and illustrated in next month's issue of this Magazine. Meanwhile, as I have frequently been asked questions respecting fittings for boxes, doors, drawers, etc., for small cabinets, I may take the opportunity of saying that Messrs. Churchill and Co. have a very large variety of these goods in stock. Nickel-plated or gilt hinges, ¼ inch wide in each flap, and ranging in length from ⅝ inch to 1¼ inches, increasing in each size by ¼ inch, vary in price from 3s. to 4s. per dozen according to size. Sliding clasps, with a single catch, for work-boxes, glove boxes, etc., range in size from 1¼ inches to 1¾ inches, increasing in sizes by ¼ inch, and in price from 6s. to 7s. per dozen, according to size. Hooking clamps 1⅛ inch to 1⅝ inch, and 1¾ inch in length, vary in price from 5s. 6d. to 6s. 6d. per dozen, according to size. Spring catches for boxes, 1¾ inches long, are supplied at 3s. 6d. per dozen, and double sliding spring catches, 1¾ inch and 2⅝ inches in length, at 6s. and 7s. per dozen respectively. The prices in all cases include screws for fixing. Messrs. Churchill and Co have also some handy little sets of carving tools for fretwork, sufficient for the purpose of those who wish to enhance the beauty of their fretwork by the addition of some simple carving. A set of three tools 3½ inches long in the blade, in applewood handles, is supplied for 4s., and a set of six tools, 2½ inches clear long in the blade, with applewood handles, for 5s.

Messrs. Crosby Lockwood and Co., 7, *Stationers' Hall Court*, *Ludgate Hill*, send me a new volume of "Weale's Rudimentary Series," No. 237, entitled, "The Smithy and Forge," a Rudimentary Treatise, including Instructions in the Farrier's Art, with a chapter on Coach Smithing. With numerous illustrations by W. J. E. Crane. The price of the book is 2s. 6d., the size the same as that of other books of this series which have been mentioned in previous "Notes on Novelties." Commencing with a sketch of the history of iron founding, the author next proceeds to speak of the forge, the smiths' tools, the fire and fluxes, and then treats of the various operations of forging, the work and duties of the farrier, and the methods of doing various kinds of smiths' work and steeling tools. A chapter written by Mr. H. J. Witten, of Sheffield, and another on Ornamental Ironwork, chiefly by Mr. C. J. Hall, next follow, and the work is brought to a suitable conclusion with a chapter on bench-work, some useful tables, and an appendix of receipts connected with iron-working. Mr. Crane's book is original—I believe the first English handbook that has been written on this particular subject—and therefore all the more likely to be useful and much sought after both by professional workers in iron and amateurs.



MAKIN'S DRILLING MACHINE FOR AMATEURS, NO. 3.

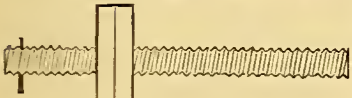
I have to acknowledge the receipt of No. 3, Vol. II., of the "Engineering Review," a weekly supplement to "Mechanical Engineering;" a useful work, from which even amateurs can gather many a serviceable wrinkle. The connection of panes of glass, etc., by "a Z-shaped strip of tin or other metal," can scarcely be considered a new invention, as it has been used both in slating and glazing, for many years.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

A Screw-Gauge for Joiners.

JACK HORNER writes:—Any amateur can make a good and useful screw-gauge with the aid of a turning lathe, and a screw bore and die. The stalk is screwed the whole length, and has two heads, screwed to fit it.



SCREW GAUGE FOR JOINERS.

These heads can be moved so as to shift through a very small distance, and when the one is screwed up against the other, they are immovable. It is also handy as a cramp for keeping stiles or rails together, while drawing in, or holding small glued jobs together.

Violin-Making.

J. TAYLOR, J. FROST, J. VAUGHAN, and others.—I have received a number of letters, none wise, but all otherwise, relative to the length of the outline of the Stradivari fiddle given in the Supplement to Part XVII. of AMATEUR WORK, which, as all the writers complain, is from $\frac{1}{4}$ to $\frac{3}{16}$ inch less than 14 inches. One gentleman, who, from his assurance and orthography, must have had *great* experience of Stradivari violins, points out the fact that, as an outline of a Stradivari violin, the drawing is "perfectly useless." Another, whose question is rendered harmless by his innocence, doubts the genuineness of the fiddle from which it is taken. Let me say once and for all, that I should not be likely to have taken an outline from a copy or a spurious fiddle to present to the numerous readers of AMATEUR WORK; that Stradivari made many of his most beautiful fiddles much shorter than 14 inches; and that, in choosing an outline to set before my readers, I chose the most elegant and perfect instrument I could find from among half a dozen fine Stradivaris, irrespective of hard-and-fast rules of thumb by which to regulate my choice. I have laid some of these lucubrations before Mr. Hill, and I append the letter I have received from him in reply:—

"72, *Wardour Street, London, W.*,
April 14, 1883.

"Dear Sir,—We have been looking over the letters you laid before us yesterday, and fail to see how anyone connected in any way with violins can find anything to find fault with in the outline of a Stradivari you have given in Part XVII. of AMATEUR WORK, which is a faithful reproduction of one of the most graceful and consistent patterns of Stradivari. It is true it is shorter than most of his fiddles, but this very shortness is quite in keeping with the *mignonne* elegance of the entire fiddle. It is, of course, not a "Grand Strad." or a "Long Strad.," but we think it admirably adapted to the requirements of your readers, and congratulate you on your very exact reproduction of a most beautiful model.—We are, sir, yours faithfully,

"W. E. HILL & SONS."

Fret-Sawing Machine.

HARRY.—The common saws of Swiss or German manufacture are of little use for wood thicker than $\frac{1}{2}$ inch; for any greater thickness up to 1 inch, the American hand-made saws, Nos. 7 and 8, price 1s. 6d. per doz., must be used; these can be procured from Churchill and Co., *Finsbury, E.C.* For $1\frac{1}{2}$ inch and thicker wood, use cabinetmaker's buhl-saws, which are 10, 12, or 14 inches long, and about $\frac{1}{8}$ inch broad, cost from 6d. to 8d. each, and may be set and sharpened until quite worn up. Most ironmongers can supply the last-mentioned article.

Chest Expanding Braces.

S. M. (*Altrincham*) and POLITZER are thanked for their replies to W. O., with illustration; but as an article is in preparation, showing, in detail, how these braces may be made, it is scarcely worth while to insert it.

M W. (*Burnley.*)—Your reply to W. O. will not help him. He will soon have a pattern at his command. See preceding reply.

Case for Stuffed Bird, etc.

T. H. (*Haverstock Hill*).—There is no difficulty in making a case for a stuffed bird. Cut the sides of the case to the required dimensions out of stuff $\frac{3}{8}$ inch thick. Plane it up nicely, and dovetail sides and top and bottom together, or merely nail them together with brads or wire nails, if you are unable to do this; but before doing so, run a rabbet along the front edge, of $\frac{3}{16}$ inch, or half the thickness of the stuff, and as deep as the thickness of the glass, or even deeper, if you prefer it; nail on the back, paper the interior and whiten it; and, after putting in the specimen, drop the glass into the rabbet, and secure in place by pasting narrow strips of black paper over the edges. This is one way; another way, but one which may present greater difficulty to you is, to run a narrow groove in the inner surface of the sides and bottom of the case, about $\frac{1}{4}$ inch from edge, for the reception of the glass, fixing a strip of wood on top, over the glass, to make up width of top, which has been reduced, to inner edge of groove to admit of the introduction of the glass. The edges of the case surrounding the glass may be neatly rounded off by way of finish.

New Nosing for Kitchen Stairs.

T. H. (*Haverstock Hill*).—Take off the old nosing as far as may be required. If taken off beyond the inner surface of "riser," screw a strong cleat level with the top of each riser, to sustain the horizontal board, or "tread." Then prepare new nosing of the width required. Round off the front edge, and fasten to the remaining portion of the original head with wooden dowel pins, and to the riser, with nails. This will make a strong, at the same time, a neat job.

Two Useful Preparations.

H. S. (*Hackney*) writes:—I send the names of two things which I think are very little known, and which I find very useful in wood working; the first is called "Thomson's Liquid Enamel" an invaluable polish, it is used in the same way as ordinary French polish, without any of the rubbing down or spiriting off, and is done in a quarter the time and with a quarter the trouble. I doubt if it is a bit more expensive in the end, as it goes a great deal farther than the other. Used as a finish for the other polish it surpasses any other that I have used or seen in brilliancy; it is also very good for leather. It is only to be obtained, to my knowledge, at 17, *Devonshire Square, Bishopsgate*, and is sold in 6d., 1s., and 2s. bottles, or by the measure, 3s. a pint; eight 1s. bottles go to a pint. The second thing is "Seeligmann's Patent Flint Paper," it is the same price as Oakey's Glass Paper, and is double as good. I send you a piece for trial. The only place that I know of where you can get it is at the wholesale place, Müller, Uhlich & Co., 37, *King William Street, E.C.*, they will oblige you with as little as a quire for 8d.—[The Patent Flint Paper is excellent.—ED.]

Pianoforte Toning.

J. G. (*Manchester*).—In the illustration, the extent of penetration of the toning-tool has been somewhat exaggerated in engraving. The darts, as is stated, show direction merely; the needles do not pass through the felt as in sewing. The object is to very slightly loosen the surface of the felt where this is brought into contact with the wires, and the point of the needles should be inserted only just so much as will tend to the attainment of this object. The motion of the tool is as if the operator aimed at making a felt rasp, the motion in the second direction being a minimum. The tool is held just like a writing pen. From what you say it seems probable that you have overdone it. You had better refelt the hammer you refer to, and be more cautious next time.

China Painting.

SUBSCRIBER. — 1. Under consideration. 2. Met in paper No. 1. 3. The series meets this to the utmost nicety.

HOME MADE.—1. Ordinary red and some of the iron browns; chrome green; and one or two antimony yellows. 2. An ordinary kitchener and a few crucibles and tongs, and pestle and mortar, and the requisite chemicals, which are not expensive. 3. Spon's Workshop Receipts; De Brongniart Traité des Arts Céramiques; Ure's Dictionary; Watt's Dictionary of Chemistry, under the various metallic oxides.

N. H. — Section 32 (*d*) was a short paragraph (inserted in the proof, but accidentally omitted in revising) recommending Hancock's Special Medium, which will doubtless meet your requirements. It would, I imagine, be on sale at any of the depots for his colours; but certainly can be got at Reeve's, Cheapside.

W. G. W. (*Reigate*).—1. Muffles in which to fire china may be procured by the amateur, but they are expensive. The subject of firing will be treated of in due course. 2. If you mean *oil* colours, they must be reground on the slab with the muller, and remixed. Whose make do you use? Hancock's Keramic *Water* Colours, however dry they may have become after prolonged exposure on the palette, will at once soften again with plain water, to which may be added, in extreme cases, a touch of megilp.

CHINA.—The subject of firing will be dealt with in due course; but, in answer to your inquiries, I may say here that the simple requirements of a "muffle," or kiln in which to fire painted ware, are that it should be smoke-proof and contain two outlets, one a vent for the escape of the volatilised mediums, the other a tube through which "tests" are drawn from time to time to see how the firing is progressing. The test is the *exact* development of rose colour. So you see the determination of the moment when the firing is doue is a *practical* one. The arrangement is such that the kiln is surrounded by live fuel or flame. These kilns are expensive, except for very small articles, and the firing of them also runs into money; but as you do not give your address, or any idea of your ordinary amount of work, I cannot say whether it would be profitable for you to do your own firing.

Fret Machine.

J. R. (*L'anrwst*) writes:—To those of my fellow amateurs who want a simple and effective fret machine, I would recommend them to make one from the design and plan given by Mr. Laker in Part XIV. of AMATEUR WORK. Since that part appeared I have made one which I would not like to part with, and which is admired by all who have seen it. In the main I followed out the instructions given by the author, but there were some little matters of detail which I consider to be an improvement. I used very dry native oak instead of ash. In the bearings of the spindles, in order to reduce the friction and wearing of the wood, I inserted pieces of sheet brass, making a puncture in the plate or sheet of brass from the inside with a fine pointed punch, the projecting piece caused by the punching of the hole on the top piece suits in the oil hole of the cups and the bottom in a small hole made in the bottom of the plummer block to receive it, which prevents the sheets of brass from turning with the spindle. By this means the wooden plummer blocks answer all the purposes of iron and brass bearings. The tenon of the plummer blocks, Fig. 17 in *Supplement*, I made sufficiently long to receive a cotter or key under the rail, which being made to "draw" secures it in such a way as a wedge or glue cannot do, and it has the advantage of being removed, if necessary, and put back again at leisure, or they can be renewed without the least damage being done to the rail. In making these remarks I do in no way find fault with the specification. The alterations I have made are by additions only, and I think that Mr. Laker will agree with me in these alterations. The correction made in Part XV. was too late for me to act upon I was puzzled to know how he could have made the crank rod as long as he did. One thing more I have to do to make the machine complete, and that is to attach a drill for boring holes. And I am thinking to replace the wooden table top by sheet iron, No. 14 B. W. G.

Fountain.

EGRORO.—Your query is somewhat vague, probably the sketch in Part XVI. of AMATEUR WORK, under the head of "Ferneries, etc.," will give you an idea respecting the simple requirements of a reservoir fountain.

Photography.

J. C. H. (*Windsor*).—Messrs. Marion and Co., 22, Soho Square, Oxford Street. Mr. C. E. Elliott, 36, Jewin Street, Aldersgate Street. Mr. George Smith, Sciopticon Co., 26, Colebrooke Row, near the Angel, Islington.

C. DE V.—A dark room is an absolute necessity for the practical working of photography. You must have somewhere to change and develope the plates, and a perusal of the various papers on photography in the early numbers of the work will show how easy it is to make an apartment dark, or suitable for the purpose. We have seen a W.C. turned to good account by more than one clever worker. But if you mean, is a dark tent a necessity? then we answer, No. If you really are unacquainted with photography, and we gather such from your note, we fear you are going to try too much all at once. Buy a C. de V. camera and lens, and become accustomed to the manipulations required. Buy next Friday's issue of the *British Journal of Photography* and the *Photographic News*, 3d. each, and spend 1s. on each of the almanacks published by the above papers. See also answer to J. C. Hopkins. To do what you require would cost about £20, all told.

Roofing Small Outhouse.

JUSTITIA.—It depends very much on the purpose for which the outhouse is intended, and its position and superficial area. The cheapest roof that you can have is weather boarding, which will be nailed on in a horizontal position, on boarding placed vertically with slips nailed over the joints. But if your roof is exposed to the sun, or has a southern aspect, in other words, it will split with the heat in all probability and leak, thus proving a dear roof. A glazed roof comes tolerably cheap, as this will cost you from 4d. to 6d. per foot super when complete. If you have boards covered with zinc, which makes a good job, you may reckon the zinc work at 6d. per foot super complete. Lastly, you may have corrugated iron, which costs from 25s. to 27s. 6d. per cwt., and is sold in sheets ranging from 6 feet by 2 feet, to 8 feet by 3 feet, in gauges that range from $1\frac{1}{2}$ pounds to $4\frac{1}{2}$ pounds per square foot.

Telephones.

WATCH JOBBER.—Your first letter was accidentally mislaid. I am sorry that I cannot write any more articles on the subject, but perhaps some correspondent will tell you how to make a microphone.

E. A. W. (*Anerley Road*).—I cannot give an easier way to bore the holes in telephone case than with a long gimlet. Bore half way through from one end, and then start from the other till the two holes meet in the middle.

A. B.—Test your bobbin wire with the battery, to make sure it is perfect and not short-circuited. If you find it all right, then the fault lies, I think, either in your having the disc too far away from the end of the magnet, or else, when vibrating, it touches the edge of the bobbin. You had better allow the end of the magnet to project clear of the bobbin, and then bring the disc as close to it as possible without actually touching.

Self-Acting Gas Generator.

W. M. B. (*Winterborne, Monkton*).—Bateman's Self-Acting Gas Generator, about which you inquire, is a perfectly genuine affair, and would be most useful in many situations and for many purposes for which it is not possible to obtain gas. As far as I understand it, it is somewhat similar to the contrivances used to light up travelling shows and stalls in markets where no other system of lighting can be brought into operation. The apparatus, which is made of copper, zinc, or other metal, is entirely self-acting, and very simple. There is a reservoir, which is provided with the apparatus, into which patent gasoline is put, and this is converted by the generator into pure gas of a high illuminating power. Ordinary gas-fittings are used with the apparatus, which is made in different sizes to supply from one to one hundred lights. The cost of the generator ranges from £1 5s. for a single light, to £9 5s. for twenty lights. For a single light the size of the generator is 36 in. by 6 in. by $1\frac{1}{2}$ in., and this gradually increases until it reaches 48 in. by 48 in. by $3\frac{1}{2}$ in. for twenty lights. To meet the requirements of those who wish to test the efficacy of the system, a sample set is supplied for £1 5s., all complete and ready for fixing, comprising a one-light generator, twenty feet of piping with unions all properly fitted on, and a bracket and burner. For lighting an amateur's workshop in any place where gas cannot be laid on, it is difficult to find any other mode of lighting more suitable and convenient than this. The apparatus is supplied by Mr. John Bateman, Engineering Modeller, 131, *High Holborn*, who is the patentee and maker.

Windmills.

LARNE MILLER.—An illustrated article is now in type, describing a model windmill of the kind you mention.

Fern Cases.

A. B.—The series of articles now appearing in AMATEUR WORK, on "How to Make and Manage Ferneries," will contain several designs of the kind you require.

J. W. S.—Your wants will also be met in the above articles in an early number of AMATEUR WORK.

Castings for Mowing Machine.

G. F. D.—1. I know no manufacturer of mowing machines who would supply you with all the parts of a small machine of this description, which is what you appear to want. Perhaps Messrs. A. A. Dorrington & Co., *Imperial Chambers, Accrington, near Manchester*, could help you with castings, made specially for you, if you write to them. 2. I will endeavour to ascertain the names of some firms who will supply the parts of a watch, but I fear you will find it a troublesome task to put them together. Try the parts of a simple clock first.

An Arrangement in Brown Paper.

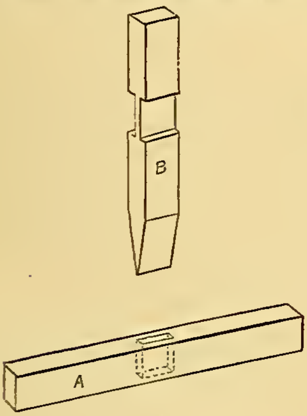
H. A. M. (*Kentish Town*).—The labour of removing paper would be more, and the liability of injuring the edges left greater in this way; while also, to my own taste, less satisfactory in its effect. The slips being the more natural way of working, and the corner joins rather a pleasant break than a flaw.

Incised Work.

J. T. F. (*Brixton*).—The method of doing this ornamental work will be treated by the author of "Wood-Carving for Amateurs," in his papers on this subject.

Enigma in Wood.

LIGHT-KEEPER sends the following "enigma in wood." Get two pieces of clean, straight-grained yellow pine, recently cnt from the log that is not seasoned, 9 in. long, $1\frac{1}{4}$ in. broad, and $\frac{7}{8}$ in. thick. In the middle of one of these make a $\frac{1}{4}$ in. mortise $1\frac{1}{4}$ in. long, as represented at A; and on the other piece, after it has been dressed to $\frac{3}{4}$ in. thick, at 3 in. from one end, make a tenon $\frac{1}{4}$ in. thick and $1\frac{1}{4}$ in. long, as represented at B, and taper the other end as shown, so as to make it easy to introduce into the mortise. Then get both pieces steamed, and while they are heating prepare something to support the sides of A, so as to prevent it from splitting when B is being driven through, and a strong cramp or vice to compress B. Then, when the wood is thoroughly steamed, take B and place it in



ENIGMA IN WOOD.

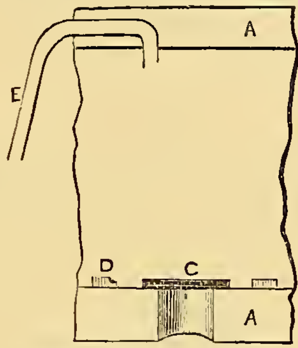
the vice or cramp, with a piece of hard wood on each side, so as to press its whole surface from the tenon to the tapered end equally, and screw up as hard as possible. Then withdraw A from the steam, and place it in its prepared position; try the screw again on B; then take it ont, enter its tapered end into the mortise, and drive through until the shoulders that have not been pressed rest on A; then put them into hot or warm water and leave them in it for several hours, then take them out and dry; afterwards cnt all the arms to an equal length, and clean off. It will allow of examination better if the tenon on B is made 2 in. long, so as to enable A to be moved along, as when all is firmly together it will be at once asserted that the cross is made of three pieces.

Microscope for Amateurs.

I. M. (*Kirkcaldy*).—An article on this subject is at last, I hope, within "measnrable distance" of publication. The microtome will be mentioned therein. No reliable information can be obtained about the eidograph. Your friend confounds it with the pantagraph, a machine which is used for enlarging or reducing drawings to scale. These are cheap enough; indeed, it would cost more to make one than to buy one.

Blower for Fret Machine.

J. T. F. (*Brixton*) writes:—I have never heard these could be had separately to suit machines of the improved "Lester" type, but a line to any of the dealers in them would settle the point. If he cannot get one they are simple enough to make. Two circular pieces of any light wood, abont the size of $1\frac{1}{4}$ inch in diameter. Bore a hole in centre of one of these $\frac{1}{4}$ inch in diameter, and put over it a lap of thin kid or leather. Now fix in some way a little lead round the space uncovered by the leather; on the other side, cover it all over with a bit of green baize or old velvet, cutting out where the hole is, of course. Procure some brass tubing, $\frac{1}{8}$ inch in diameter, used in model locomotive building, about 2d. a foot; an inch and a half will be all you want. Bore a hole in *edge* of the other piece of wood, $\frac{1}{2}$ inch deep, and work this hole out on to



BLOWER FOR FRET MACHINE.

A, wood; B, leather; C, leather over hole; D, lead; E, brass tube.

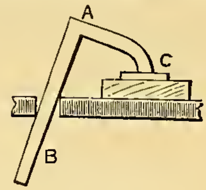
the flat side of wood. Insert your tube, and bend it down over edge of wood. Now cover both all round on the edges with a piece of pliable leather or kid, and your bellows are complete. It is fixed on underside of the upper arm of saw, and at every stroke the bellows are compressed in contact with the table.

Rust Preventive.

J. M. A. (*Leith*).—I am not acquainted with the American preparation, of which you ask the name. A mixture for preserving iron and steel goods from rust, may be made by melting $\frac{1}{4}$ oz. of camphor in $\frac{1}{2}$ lb. of hog's lard, adding a little black-lead in order to darken it and assimilate it to the colour of iron; or, 6 parts of rosin, 9 parts of sandarac, and 3 parts of lac, may be subjected to a gentle heat until melted, 6 parts of essence of turpentine being added gradually, the mixture being kept well stirred all the time until the ingredients are thoroughly incorporated. Then add 9 parts of rectified alcohol, filter through blotting-paper and keep for use in a tightly-corked bottle or jar. Millen's "Snow and Wet Repeller and Sole Protector," prepared by Humphrey Millen, *Fern Factory, Little Marlow, Bucks*, when smeared over gun barrels, tricycles, knives, bits, garden tools, and all steel and iron goods, with a warm rag, keeps them from rusting. A box of this direct from the factory costs only 1s. post free.

Bench Holdfast.

E. H. B. (*Penang, Straits Settlements*) writes:—In Part IX. of AMATEUR WORK you gave us some admirable designs of German work benches; may I bring to your notice an appliance common to every French work bench, which would render the benches you illustrate still more perfect? The appliance I speak of is called a "valet," and is in form as under. It is formed of a bar of one inch diameter iron, drawn down square, and bent into the above form. The lower end, B, is inserted in a circular hole through any convenient part



"VALET" OR BENCH HOLDFAST.

of the bench. When it is required to hold work down firmly with it, the work is placed under the end C. A sharp blow is then struck with a mallet at A, which causes B to jamb slightly crosswise in the hole, and so the work is held firmly until by a slight blow at the back of A the "valet" is loosened. I have never found any English amateur carpenter acquainted with it, and it is, of course, not available on most English work benches, they being as a rule too thin in the top. I find its help invaluable, as it gives me the free use of both hands for mortising, carving, or the like; and it is equally an assistant in sawing. I may mention that, to prevent the end C leaving ugly marks or dents in soft wood, a small piece of softer wood is placed between C and the work. It can, I believe, be obtained of any good tool maker in Paris; but it is so simple in construction that an ordinary blacksmith can make it. If it is really unknown, I can assure any brother amateur who will try it that he will ever after wonder how he did without it. [Our correspondent's "valet" is the French form of the old bench holdfast, of which a new and improved form has been introduced of late years. He is cordially thanked for his communication.—ED.]

Subjects in "Amateur Work," etc.

THE GROWLER.—This Magazine is intended especially for *men*, but all amateurs of the male kind, whether men or *fathers of men*, will find something in it to suit their wants. You do not name your "particular hobby," but I gather from the postscript to your letter that it is fret-cutting; if so, I am glad to be able to tell you that some special things in this kind of work are in hand, and that in Vol. III. a series of papers on Model Yacht Building will see the light. Instead of *growling*, tell me what you and your friends want, and I will endeavour to satisfy you as far as lies within my power. If you want a duplicate copy of any particular Supplement send 6d. to the publishers, and name the Supplement you require, and they will send it to you in a post or two.

House-Painting and Papering.

Mr. George Edwinson writes:—Readers of my articles on the above subject will be glad to know where to get an assortment of cheap artistic wall-papers. Samples of such an assortment have beeu forwarded to me hy Mr. T. C. Stock, 8, *Victoria Street, Bristol*, who will also be glad to forward samples post-free to any intending purchaser. The papers are of good quality, and very cheap at the prices quoted, some thin but useful papers of good design being offered as low as 2d. per piece of 12 yards, or £3 17s. 6d. per ream of 480 pieces, when 50 pieces or over of a pattern are ordered. Thicker papers are also offered at prices ranging from the above up to 9d. per piece. The following table of measurements will he found useful to amateurs:—

Stock's Table to Measure Rooms for Paper.

Height in Feet, from Skirting to Cornice.	*Measure round the Walls in Feet, including Doors, Windows, etc.* 28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
7 and under 7½	4	4	5	5	6	6	7	7	8	8	9	9	9	10	10	11	11	12	12
7½ ,, 8	4	4	5	5	6	6	7	8	8	9	9	10	10	11	11	12	12	13	13
8 ,, 8½	4	5	5	6	6	7	7	8	8	9	9	10	10	11	12	12	13	13	14
8½ ,, 9	4	5	5	6	7	7	8	8	9	9	10	11	11	12	12	13	13	14	14
9 ,, 9½	4	5	6	6	7	7	8	9	9	10	10	11	12	12	13	13	14	15	15
9½ ,, 10	5	5	6	7	7	8	9	9	10	10	11	12	12	13	14	14	15	15	16
10 ,, 10½	5	5	6	7	8	8	9	10	10	11	12	12	13	14	14	15	16	16	17
10½ ,, 11	5	6	7	7	8	9	9	10	11	11	12	13	13	14	15	16	16	17	18
11 ,, 11½	5	6	7	8	8	9	10	10	11	12	13	13	14	15	16	16	17	18	18

Explanation.—Find the height of the room hetween the skirting and cornice in the left hand column, and the nearest figures to the measure round the walls on the top line; the figures where the two lines would cross or meet will show the numher of pieces a room will require. Thus, a room not exceeding 60 feet round the walls, and not exceeding 8 feet between the skirting and cornice, will take 8 pieces.

*** The space occupied hy windows and doors must invariably he included as part of the measure round walls.

Stencilled Decoration.

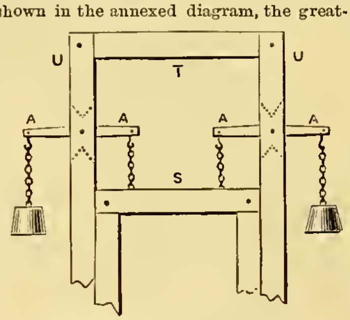
Angleton writes:—Amateur decorators desiring new designs for stencilling papers will do well to communicate with Mr. E. Gallop, 16, *Grapes Hill, Norwich*, who has forwarded to me a sample design for a stencil, printed ou thick paper. Mr. Gallop will supply such stencils at 1s. 6d. per dozen, or cut them out ready for use at a charge of 6d. each. He will also furnish estimates for designing stencil plates to order.

Brazing and Soldering.

Mr. George Edwinson writes:—Mr. G. Freeman, 112, *Newhall Street, Birmingham*, sends me an account of a new and improved Heat Deflector, for use with the hlow-pipe, as a support for the work whilst it is heing brazed or soldered. This article is made of a very light porous clay, specially prepared and corrugated, so as to allow the heat to pass entirely underneath the article to he soldered. It is superior as a support to that of an ordinary fire-hrick, it does not burn away like composition supports, it does not crackle or spit like charcoal, nor crumhle away like pumice. The article has heen tested by many of the leading electroplate and jewellery manufacturers of Birmingham, who speak highly in their testimonials of its efficiency. Blocks of the material may he had in disc from 14 inches in diameter, or in lumps 12½ inches square at 3s. each.

Improvements in Fret-cutting Machine.

H. W. B. (*Morwenstow*) writes:—I take the liberty of suggesting an improvement in the mode of making a simple fret-sawing machine, as described in page 36, Part I., Vol. i., of Amateur Work. I cut a hole about $1\frac{1}{8}$ inch wide, and the shape as shown in the annexed diagram, the great-



IMPROVEMENT IN FRET SAWING MACHINE.

A,A,A,A, Arms of levers; S, Upper side of sawing frame; T, Transverse piece; U, Uprights; W,W, Weights.

est length 6 inches, and least 3 inches, about a foot from the upper transverse piece. In each upright and through them I put pieces of wood about 2 feet long and 2 inches wide in middle, diminishing to 1½ inches at the ends, as shown in diagram. To the outside arms I hung equal weights, and attached the inner arms to the npper side of sliding frame with chains, and I find this plan answers admirahly.

Pulford's Magnetic Paint.

Mr. S. Stanton Markham, F.R.I.B.A., District Surveyor, St. George's in the East, etc., gives the following testimony in favour of Pulford's Magnetic Paint. He writes:—Under the head of "Novelties" in Amateur Work, you ask for information respecting Pulford's Magnetic Paint. As I am pleased with the result so far of my experience of it, I think your Journal should have the benefit of it. Two years ago I painted the 9-inch cemented walls of a detached house, standing within three hundred yards of the sea on the South Coast, with two coats externally, as also the corrugated iron roof and rear of huilding, and it has effectually kept out all traces of damp and wet during two of the wettest and most stormy winters, I think, on record. The papers on the walls were preserved and dry, the paint having resisted the penetrating force of the wind, and kept out both rain and sea moisture. I think I gave the south-west side three coats. [The hest thanks of the readers of Amateur Work are due to Mr. Markham for the information he has so kindly given.—Ed.]

Moving Models for Bazaars, etc.

Hellesdon.—1. The first of a series of papers on "Moving Models for Bazaars" will appear in Amateur Work for July. 2. "The Violin: and how to Master it," is a work on playing, not making, the violin. It is puhlished by Simpkin and Marshall, where you may obtain it.

Strong and Simple Home-made Furniture.

J. B. (*Hereford*) writes:—I have made most of the articles as described hy Mr. Mallet as "Strong and Simple Home-made Furniture," and find the patterns very good; hut I would advise any other amateur who may he thinking of making them to use stouter wood than that mentioned, more especially for the legs of the tahles, which ought to he 2-inch stuff, instead of 1-inch, or the table will not stand firm; and the same with the other articles.

Octopus Glue.

Ignoramus.—1. You will find instructions for tinning the soldering iron in "Brazing and Soldering," in Part XIV. of Amateur Work. 2. The sample of Octopus glue that was sent to me appeared to he excellent; and as it can be used cold, it is certainly most desirahle for the generality of operations in which glue is required. The sample was sent me on the recommendation of an amateur who uses it, and thinks most highly of it, as I mentioned in my notice. I will subject it to fresh tests. Of course, the "Gloy" Company know their own business best, hut I think it would he desirahle for them either to send out sample bottles to applicants who cannot obtain it in their immediate neighbourhood, or to supply lists of tradesmen in different localities from whom it can be procured.

C. M. (*Fulham*) finds fault with the Octopus glue. He says:—It will stick and hold fast, but only after several coats. This is due to its being absorbed hy the wood, and it is only after the wood is well "stopped" that the Octopus will remain on the surface, and hold. I have heen trying it to glue up some picture-frames, hut the result was an utter failure. Compared with ordinary glue, the Octopus is more expensive, more trouhle, and an infinite deal less satisfactory. Another thing I found, that when used to oak (and, I expect, on any light, hard wood), where it squeezes out—in fact, wherever it touches it—it stains the wood a dark colour.

Oil-Gilding.

RED DRAGOON.—A series of articles on Gilding in all its branches will appear in Vol. III. In oil-gilding on wood, the surface is rubbed very smooth with Dutch rushes, and the wood is then primed with glue-size, and painted with two coats of oil-paint, with a final coat of flatting. The work is then sized, generally receiving two coats, the gold leaf being applied when the second coat is in a proper state to receive it, which is denoted by its feeling clammy or sticky when touched. This mode, of course, fills and conceals the grain of the wood. In order to show the grain of oak, the gilding must be applied to the wood itself, which must be sized to receive it.

Telescopes.

B. (*T——n*).—I cannot venture to give an opinion on the telescope you mention, because I have never handled it. The range of a telescope depends very much on the size of the object viewed through it. Thus, you can distinguish some objects at twice, thrice, and four times the distance that you can others. For example, if a telescope enables you to discern the face of a clock at a distance of two or three miles, you could not see the same object as distinctly at double the distance. When *lines* are spoken of in reference to scientific subjects as a means of measurement, the line denotes the twelfth part of an inch: the *line* is further subdivided into 6 points. Thus, 15 lines are equivalent to 1¼ inches. It relates, therefore, to size as concerns telescopes, and not to power.

Varnish for a Screen.

W. R. C. (*Southsea*).—Size the screen with good clear size, and then varnish it with some best pale carriage-varnish, or white, hard spirit-varnish. If you wish for a more delicate mode of treatment, prepare a size by boiling clear parchment cuttings in water in a clean glazed pipkin, straining the liquor when a clear size has been produced. Give the work two coats of size, and varnish with two or three coats of the best mastic varnish, or a varnish composed of 3 ounces of Canada balsam, and the same quantity of clear white resin, dissolved in a pint of oil of turpentine. Another good varnish for coloured pictures is Canada balsam dissolved in spirits of turpentine, in the proportion of 1 ounce of the former to 2 ounces of the latter.

Sale of Fret-Work.

A SUBSCRIBER.—In order to dispose of any fret-work you may cut, you had better make arrangements with some dealer in fancy goods in the locality in which you live. I cannot possibly say whether or not the prices you may get will be remunerative.

Hydraulic Ram.

H. V. (*St. Catherine's*).—The construction of a hydraulic ram would be, I fear, quite beyond your power. It would require much space and an elaborate diagram to make its construction intelligible; and when given, it would be possessed of no practical value to amateurs. You will find a description of the machine in any good cyclopædia; for example, Knight's "English Cyclopædia," Division, "Arts and Sciences."

Net and Canvas Hammocks.

H. J. (*Finsbury*).—In making netting of any kind, the tools used are a flat piece of wood or bone, on which the successive rows of meshes are formed, and a wooden or bone needle of peculiar form, on which the twine is wound prior to commencing work. Canvas must be sewn with a sailmaker's needle.

Treatment of Enamelled Leather.

AN ARTICLED CLERK.—A durable varnish for leather is made by boiling litharge in linseed oil; but in your case the best thing, perhaps, that you can do is to sponge the surface of the bag with warm water only, and when nearly dry to rub it over with oil, also applied with a sponge. Castor oil is the best oil for this purpose. It depends entirely on the varnish that has been applied to the leather, and to the extent the surface is cracked whether or not this process will be beneficial. Directions for making a library table with drawer will be given in Vol. III. For the present, see directions for making a table in "Strong and Simple Home-made Furniture," in Part X.

Scale of Sideboard.

W. H. B. (*Midlothian*).—For the sideboard illustrated and described in page 49, Vol. I., you will find 3 feet a convenient height for the lower portion, from the ground to the upper surface of its cornice, immediately under the slab on which the upper part is reared. This gives about 6 feet 6 inches for the extreme width of the sideboard taken along the edge of the slab, and about 7 feet 3 inches for the extreme height from ground to top of cornice of central part. The width of the lower portion is 2 feet, and that of the upper portion 1 foot. From these data you can easily construct a working drawing to scale. Make this drawing on a scale sufficiently large to show all the detail. A scale of 1½ inches or 2 inches, or even 3 inches to the foot, or quarter scale, will not be too large.

Painting Magic Lantern Slides.

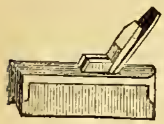
PEINTRE.—The process of painting slides for the magic lantern will be treated during the winter months. In painting slides, you should use transparent colours, namely, Prussian blue, gamboge, carmine, verdigris, madder brown, indigo, crimson lake, and ivory black, with the semi-transparent colours, raw and burnt sienna, and vandyke and cappal brown, thinning oil colours with ordinary megilp to a degree just sufficient for proper working, and using for a medium for laying on the first coat of water colours gelatine thoroughly dissolved and hot. When perfectly dry, this coat can be shaded and finished with water colours mixed in the ordinary way with cold water; but the manipulation of the added colours must be gentle, so as not to disturb the layer first put on the glass. A thin coat of the best mastic varnish heightens the effect of shades painted in water colours, but oil colours require no varnish.

Difficulties of Amateurs in the Colonies.

C. G. (*Hobart, Tasmania*) has written the following letter, which I give *in extenso*, as it may prove interesting to many an amateur at home. C. G. says:—I have, within the past few months, become a subscriber to your excellent publication, AMATEUR WORK, and have just received all the back numbers through my bookseller. During my spare hours I occasionally pass my time in "fretting," for which purpose I use the simple, but useful "Roger's" machine. The great drawback to amateurs in this colony is the extra expense attendant upon everything imported, and also the impossibility of obtaining many of the most simple necessaries in order to carry out any work to a satisfactory completion. My machine, which in England, may be had for 13s. 6d., cost me 25s.; while for a "Prize Demas" I have been asked £3 10s., the same to be had in England for £2 2s. Only a few days ago I endeavoured to obtain the preparation for etching on glass, mentioned in your "Ways and Means," in Part I. An ounce bottle to contain the liquid, made of gutta-percha, cost 2s. 6d. After visiting every chemist's shop in the town I could not get the fluoride of ammonium for love nor money. The chemists have never had it here, and I was informed by one, that if he had any, he would not charge less than 9s an ounce for it. This was quite enough for me, and you can easily understand from these quotations that amateur workers in Tasmania are few and far between. I often envy the amateurs of England the ready ease with which they may be supplied with everything required, and at such a low price. Another drawback is, that if I should send to England for a few of the small things advertised in your AMATEUR WORK, as, for instance, carbons for electrical purposes, a small machine, with clamps, for cutting and fitting picture-frames, and such like useful articles, each one being sold at different establishments, how can I best get them sent out to me in Tasmania? I know it is possible to order things through the merchants here, but they would not be bothered with such trifles, or if they did send for them, the receiver would have to pay pretty dearly for the things thus obtained. Do you know of any way out of this difficulty? There has just been a person here, styling himself "Professor" Mills, who ornaments and writes names on glass tumblers *with a pen*, while you wait. The chemicals used form a mixture very like thick cream, and are kept either in a leaden, or gutta-percha bottle. By the way, I think a paper on "How to Manufacture Gutta-Percha into Useful Articles," would be very acceptable to most of your readers, myself included. After writing on the glass, he washes off the chemical with a damp towel, and gives you the tumbler beautifully engraved with wreaths of flowers, etc. Can you, or any of the readers of AMATEUR WORK, inform me as to the chemicals used for this work; also, their cost, and if an ordinary pen may be used for writing with the acid? To return to fretting. Will you kindly let me know where to obtain Griffin's Patent Fret-Saws, their price per gross and probable cost on arrival in Tasmania? There are numbers of things I should very much like to have information upon, but fear you will tire of your new correspondent.

Stop-Chamfer Plane.

PUNCH writes:—I should like to bring under the notice of your readers a chamfering plane which I have lately come across. In page 477 of Vol. I., AMATEUR WORK, I saw a notice of a new chamfer plane which I have seen at work. It works very well, but cannot be compared to this one. I enclose an engraving of it, cut out of a price list of Messrs. Booth Brothers, Dublin. Its price is 4s. The advantages claimed for it are, firstly and chiefly, it not only works right up to the "stop," but does the "stop" also; it will cut any size l chamfer, and the size can be regulated by a stop which can be seen in the engraving. I have used the plane a great deal, and it has saved me weeks of labour, and therefore I thoroughly recommend it. [I have not yet met with this plane, but from the illustration you kindly send, and which I have copied here, I am of opinion that it would do its work better than the chamfering tool to which you allude, and be more useful to the amateur.—ED.]

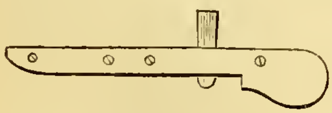


STOP CHAMFER PLANE.

INFORMATION SUPPLIED.

Tool for Cutting Moulding.

J. C. (*Stoke Newington*) sends reply to E. W. (*Headley*):—The tool you want is a "scratch," and easily made. In beech is best, in inch-stuff, made as shown, and cut through centre and parts where friction, slightly rounded; the shoulder stands out about half an inch, the stock 9 inches long,



SCRATCH TOOL.

and screwed together as shown. The cutters are made from the ordinary scraper, and sharpened in the same way. By cutting up a scraper and with a file, can make any shape moulding required; only when making a complicated cutter, make it in parts, or the difficulty in sharpening will be great. More details I would with pleasure give, but defer taking up your valuable space.

Design for Small Book-case.

YOUNG CABINET-MAKER sends some suggestions on this subject for APPRENTICE MERCHANT, which shall be forwarded to him if he will send his name and address.

HEREWARD sends, in reply to APPRENTICE MERCHANT, the annexed rough sketch of book-case, and thinks if APPRENTICE MERCHANT will examine it for a moment or so, he will at once see how it is put together; but perhaps it will be useful if I say a few words about the way it is made. I need hardly say it is very simple of construction, and when finished, presents a neat and nice-looking addition to any room, showing off his volumes to perfection. I will say nothing about what wood is to be used, but mahogany would be very suitable. Having planed and cut to size the sides and top and bottom, he must proceed to cut the grooves to admit shelf, as shown in Fig. 4. This done, he can commence to fix them permanently by screwing, as shown in Fig. 2, top and bottom to sides; likewise put in back, not forgetting to leave top and bottom projecting forward to the thickness of door.

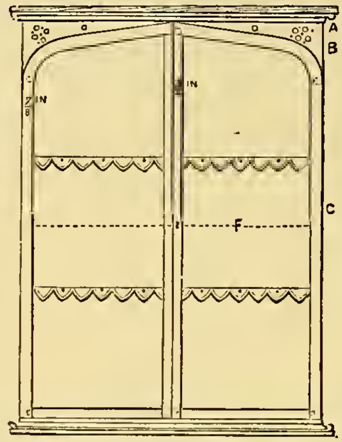
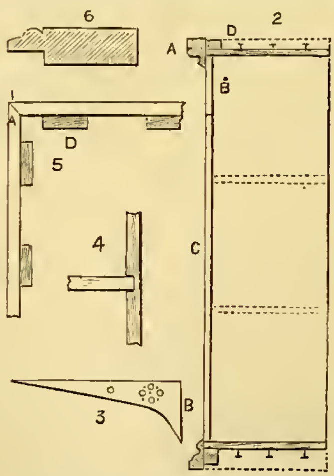


FIG. 1.—FRONT ELEVATION OF SMALL BOOK-CASE.

A glance at Fig. 2 will at once show what I mean. Now cut two of Fig. 3, making holes half through for ornament. Fix a good bold moulding round top and bottom, letting that which goes round top just cover

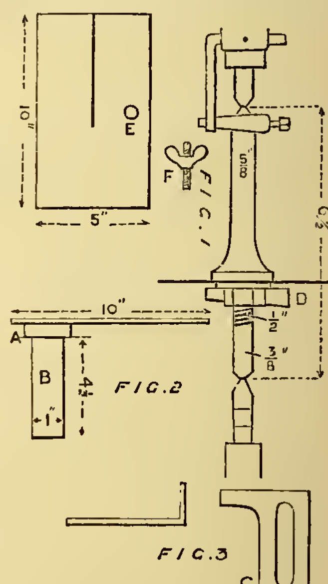


FIGS. 2, 3, 4, 5, 6.—END ELEVATION AND PARTS OF SMALL BOOK-CASE.

joint made by the piece B and top, gluing blocks of wood as seen in Figs. 2 and 5. Now commence making doors. Refer to Fig. 1, and he will see at once the method of fixing the tenons are dotted. He may stick a moulding round the inside of door-frame, if he would prefer it; this is likewise shown in Fig. 6. But, in any case, the rebate must be made to admit glass. Now, as regards glass, *one* piece of thin plate-glass to each door would look by far the best, but certainly dearest; or two pieces in each door of ordinary window-glass. If this latter course is followed, a bar, F, Fig. 1, must be fixed. All that now remains is to put fastening or lock on door, and likewise nail, with ornamental brass-headed tacks, embossed leather to front of shelves. This finishes the work. If he would prefer one door instead of two, simply leave out middle bars; this would show off books much better, but not look so nice in itself. Wishing him every success, and advising him to make working drawings before he commences, I will apologize for cutting these instructions so short, but our Editor has no room to spare. I have omitted to say that if two doors are used, he must rebate half the front of the left door stile, and half the back of the right door stile, and that the width of stile be $\frac{7}{8}$ inch, with T-boss in the centre $\frac{3}{8}$ inch, as marked in Fig. 1.

Circular Saw on Lathe.

DEUTSCHLANDER (*Dresden*) sends the following reply to E. P. H. (*Surbiton*):—I have a $4\frac{1}{2}$-inch lathe, with a circular saw fitted,



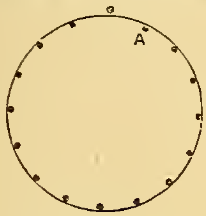
CIRCULAR SAW ON LATHE.

A, Boss to take thread of screw, and is soldered to brass plate; B, Iron stem; C, Fence or guide made from sheet brass; D, Cotter to be used instead of nut; E, Hole for thumb-screw F.

the spindle being made from steel bar, turned to a shape like Fig. 1. If the querist has no means of cutting a thread on the end for the nut, I think it might be dispensed with, and a cotter driven through the spindle against a washer, as shown by dotted lines. Now as to the table, I had mine made of cast iron (though brass does better) for cheapness. The stem is wrought iron screwed in. I have no guide, though if I wanted one, I would make it of brass plate. I omitted to say that the saw revolves between centres with a carrier. The spindle is used for emery-wheels, and I mean to use it for a gear-cutter in a frame. The stem of saw table fits T-rest socket.

Bending Wood.

J. Fernley, writes:—Wood of nearly every kind, but especially ash, can be bent by steaming or soaking in hot water. To bend the strip of wood ⅝ inch square and 3 feet long into a circle, proceed as follows: Describe on a stout plank a circle of about 12 inches diameter. Round this diameter, and just touching the line inside, drive in at regular intervals some stout screws, this is to be done all round except one space



METHOD OF BENDING WOOD.

where the screw is to be driven in ⅝ inch outside the circle. To prepare the wood, take a strip of straight grained ash, wrap it up in flannel and pour boiling water on. After soaking for a quarter of an hour place one end inside the screw A, bring the other end round the circle and slip under end at A. Now let dry and then cut to proper length. Of course you must have the strip a little longer (say 6 inches), than the finished size. I may say I have bent timbers for small pleasure boats to a smaller diameter than this without any trouble.

Substance to Produce Lather.

E. W. (*East Grinstead*) writes in reply to F. M. (*Manchester*):—Take 2 lbs. of white soft soap, 1 oz. of olive oil, 2 drms. of gum benzoin, and 48 ozs. of alcohol; let them digest. The mixture will produce a lather like soap.

Window-Cleaning Chair.

E. W. (*East Grinstead*) writes:—If G. W. B. (*Forest Gate*) refers to "Every Man His Own Mechanic," page 430, he will get a design of window-cleaning chair, with size of timbers and the method of putting together. [No: he will only find the method of making a chair, one part of which, turns on the other, so as to form a set of steps. —Ed.]

French Polishing.

Punch sends the following reply to Antipodean and J. H. (*Dudley*):—As everybody knows, French polishing is an art in itself, and, to be *really* successful, it is almost essential that you should have had regular lessons from an expert. I myself believe no amount of hints, unless verbal ones, would make a person polish well. However, I will endeavour to give my ideas on the subject. Take your piece of fret-work, and sand-paper it well. Then soak a pad of cotton-wool in linseed oil, and *thoroughly* saturate the wood with it. Let it soak in, and meanwhile procure some more cotton-wool, and make a good-sized pad with it. For the wrapper get some worn-out calico. *Partly* fill the pad with polish, put the wrapper tightly over it, and then drop one or two drops of linseed oil on the wrapper. Rub lightly with a circular motion, taking care not to continue rubbing on the same spot, but keep slowly moving all over the surface. When your pad feels dry, take a little more polish on your cotton-wool, and wrap it with a *fresh* corner of the wrapper. When a fairly good gloss appears, let it rest for an hour or so, and then with fine glass-paper rub it all off again down to the wood, and start again. Keep on working till you have a brilliant surface, keeping glass-paper beside you, and rubbing "bad" spots whenever they appear. When it is brilliant enough to please you, let it rest for a day for the polish to "go down;" rub it up again, as before, and then it is ready to "spirit off." Get some methylated spirits, and put a little into the same cotton-wool, put on the wrapper, and on that a very small drop of oil, and work it as the polish. Continue this till you can see your face clearly in the polish. You should never have more spirit in your pad at a time than is absolutely necessary; very little will do. The following are the essential points in the work:—Always polish in a warm, almost hot atmosphere—close to a fire, for instance. Always change the spot on your wrapper when you take fresh polish. Keep your pad always moving; that is, never let it rest on the work, as it is liable to pull off all the polish. Keep your hand firm, but do not use too much pressure. Never have too much polish in your pad at a time. N.B.—In fret-work it is advisable to have the work fixed by tacks to a bit of board, to keep it flat and stationary.

Cement of Gutta-Percha Parings.

E. W. (*East Grinstead*) in reply to J. B. (*Rochdale*) writes:—Take 2 parts black pitch, 1 part gutta-percha, melt in ladle, stir well, and then run into moulds.

Cement for Cork Basket.

I. O. H. (*Ballymena*) writes in reply to J. T. F. (*Brixton*):—If waterproof glue would suit, it can be made by dissolving 1 oz. of gum sandarac and 1 oz. of mastic in a pint of alcohol, to which 1 oz. of white turpentine is to be added. At same time, a very thick glue is to be kept ready, mixed with a little isinglass. The solution of the resins in alcohol is to be heated to boiling in a glue-pot, and the glue added gradually, with constant stirring, so as to render the whole mass homogeneous. After the mixture is strained through a cloth, it is ready for use, and is to be applied hot. It dries quickly, and becomes very hard, and surfaces of wood united by it do not separate when immersed in water.

Microscope of High Magnifying Power.

E. W. (*East Grinstead*) writes:—Microscopical Student cannot do better than write to Mr. J. Lancaster & Son, *Colmore Row, Birmingham*, who will give him every information he may require, and also supply him with good and cheap lenses, and any other material he may require.

Re-Polishing Old Oak.

E. W. (*East Grinstead*) writes:—Scarlet Bean had better first plane off the rough, or scrape off with steel scraper or a piece of newly-broken glass, then glass-paper with fine glass-paper, and repolish.

Spring Mattresses

Greek writes:—If Rex Rogate will kindly say what kind of spring mattress he wants, I will do all I can to help him; I think the stuffed springs are simplest. Anything in the way of bedding I will give any information required.

Bamboo Canes.

C. J. M. writes to say that W. J. M. (*Chatham*) can buy bamboo canes at Bastendorf's, in *Euston Square*.

Writing Desk.

Light-Keeper writes:—I here send an idea of a desk for J. L. (*Liverpool*). Fig. 1 is the desk as open for use, and Fig. 2 is a

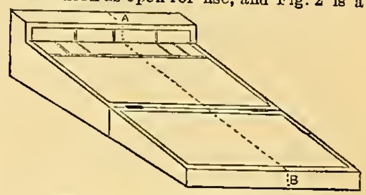


FIG. 1.—DESK OPEN FOR USE.

section along the line A, B, Fig. 1. J. L. will require a board 12 feet long and 14½ inches broad for the outside and lids, and a piece 5 feet long 10 inches broad and ½ inch thick

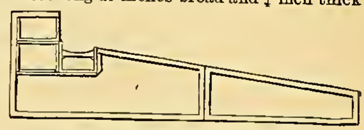


FIG. 2.—SECTION OF DESK.

for the drawers and inside divisions. Instruction in making would need considerable space and illustration, but if J. L. thinks anything further is needful I will make the attempt.

Mounts for Pictures, etc.

D. J. (*Tunbridge Wells*) writes to say that G. P. P. will find the cut-out mounts sold by Brown, Scott & Co., 82, *High Holborn*, of good quality and cheap. He should write for samples and price-list.

Bleaching Coral.

C. T. (*Bristol*) writes in answer to W. J. (*Bristol*):—I have bleached coral by directing with a finger, a strong force, or spray of water, from the ordinary water-tap. The force drives the dirt from the cells; the coral should then be dried in the sun; if not thoroughly white, or bleached, dip it in a weak solution of lime-water; then dry in the sun, or air, not before a fire. If dipped in red ink when wet, the coral will assume a blush tint.

Dissolving Vulcanised India-Rubber.

E. W. (*East Grinstead*) writes:—Experimentalist can dissolve his vulcanised india-rubber in a ladle, and stir in, while warm, rectified resin oil, taking care it does not catch fire.

Oxford Frame-Making.

R. L. C. G. (*Islington*) writes:—I find the best and cheapest house for Oxford, oak, gilt, or room-mouldings, Gus Rochefort, 29, *Basinghall Street, London*. On mention of this work, he gave me some very useful hints on Oxford frame-making. He supplies every requisite for frame-making at very reasonable prices.

Wind-Power for Lathes.

Deutschlander (*Dresden*) sends the following reply to W. S. (*Longside*) :—If W. S. wishes to do any work with the lathe, I advise an engine, either steam, gas, or hot air, as wind is intermittent, and wind-motors are always giving trouble. There are many about here being used for pumping only. Those used for chaff-cutting require many counter-shafts and cog-wheels, and are admitted to give a great deal of trouble, as they have to be taken down in the winter in windy localities, as in the first high wind they go to pieces. I also think it would be more than an amateur could make. The wheel of a size to drive a lathe would be about 6 feet diameter; vanes, 2 feet 3 inches long, $1\frac{1}{2}$ inches wide, $\frac{1}{16}$ inch thick.

Photographic Transparencies.

W. T. W. writes :—Transparencies, as described by C. T., Jun., are either Woodbury or carbon, the former quite out of reach of an amateur. Carbon transparencies are easily made, but unless C. T., Jun., has some knowledge of carbon printing, I am afraid our Editor would not care to give the room (about two columns) in "Amateurs in Council." If, however, our Editor can find room either in the Supplement or in the ordinary pages, I shall be glad to give an exhaustive article on the subject. [Kindly write an article to appear in the ordinary pages.—Ed.] Briefly, the process stands thus:—A special carbon tissue is sensitized by immersion in bichromate of potash, dried, and after exposing under negative, is immersed in cold water, and squeezed into contact with a piece of glass, covered with an insoluble film of gelatine, after which the transparency is developed by immersion in hot water at 120° Fahr. Of the beauty of carbon transparencies there cannot be any question, and, when properly done, form an exquisite method of decorating blank windows, lamp-shades, etc.

Hard Stopping for Wood.

Willing to Help sends the following reply to Exon :—Take equal parts white lead (ground in oil) and common putty (by bulk, not weight), mix together. If not required white, stain to any colour required with some ground colour, as Venetian red for red, a touch of umber to this for brown, or ochre for yellow, umber to this for stone colour, etc. Press the putty well in with the knife to get it solid, let it stand two or three days to harden, then rub over with fine sand-paper.

W. R. C. (*Southsea*), in reply to Exon, has found that beeswax melted with double the quantity of common resin makes a very hard stopping. It should be applied while quite hot, as it both hardens and cools very quick indeed.

How to Polish Stones.

W. G. (*Blackheath*) writes in reply to E. A. F. (*Cromer*) :—Level the best side of the stone with a geological hammer, take care not to break the stone; after which rub it on sandstone, or a grindstone, till a level surface is obtained. It will now be found covered with scratches; to remove these, rub the surface, kept constantly wet, on a slate. This must last till all the scratches have disappeared, and the surface is smooth. Get three pennyworth of oxide of iron, and a large flat piece of cork, with a smooth surface free from dirt. Put the oxide in an old pepper-box, pepper some on the cork, and wet it; then rub the stone on the cork for some time, renew the oxide when necessary. By this method they can be polished equal to professional work. Care must be taken that no dirt is on the cork or slate, or it will scratch the work. Begin by polishing small stones, until you are accustomed to it. There is also a stone-polishing machine sold by Messrs. Cotton & Johnson, 22, *Grafton Street, Soho.*

How to Make a Hookah.

A. W. (*Leeds*) wishes to know, page 353.—The way I did was simple. First, get a wide-mouthed bottle (a pickle-bottle or a child's sucking-bottle will do). Second, get a cork to fit it tightly; then with a hot wire burn two holes in the cork large enough for

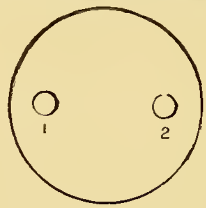


FIG. 1.

the stem of a clay pipe to pass tightly through. Fig. 1 shows cork with holes. Next, get a French straw, that is, a clay pipe, with the bowl in a line with the stem (Fig. 2); then get a short piece of clay-pipe shank about 3 inches long. Fill your bottle

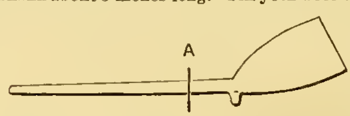


FIG. 2.

half full of water, and put in a few drops of perfume. Now place the cork in the bottle, and insert the pipe in hole No. 2, the end of the shank to be in the water. Now insert the short piece of pipe-shank in hole No. 1, and fasten a flexible tube to the top of it.

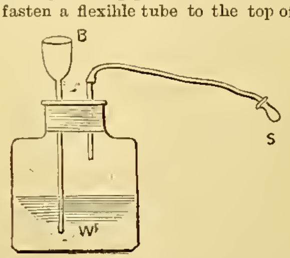


FIG. 3.

Charge the pipe-head with tobacco, light, and you are in Paradise. This is much cleaner and less injurious than the common pipe, as the smoke is washed by passing through the water. Fig. 3, hookah complete, cost price 2d. Cornelius Nepos.

Firing China Paintings.

Wm. Priday.—Paintings can be sent to No. 71, *King Street, Manchester,* to be fired.

Polishing Gun Barrels.

A. H. (*Great Yarmouth*) writes : — In answer to the question on gun barrels, I think the following are reliable receipts: No. 1, sweet spirit of nitre, 3 ozs.; gum benzoin, $1\frac{1}{2}$ ozs.; tincture muriate of iron, $\frac{1}{4}$ oz.; sulphate of copper, 2 drachms; spirit of wine, $\frac{1}{2}$ oz. Mix, and add 2 lbs. of soft water. No. 2, tincture of muriate of iron, 2 drachms; sweet spirit of nitre, 2 drachms; sulphate of copper, $\frac{1}{2}$ oz.; water, 6 ozs. Either of the above are applied with a sponge, after cleaning the barrel with lime and water. When dry, polish with iron scratch-brush, and apply again till the required shade is obtained.

INFORMATION SOUGHT.

Amateur Dentistry.

Country Bod writes :—I see in Vol. I. of Amateur Work, page 58, some remarks on dentistry, and that the writer is willing to give further information on the subject with regard to working of vulcanite work. I should like him to write us a short article on the subject. Would not amateur mechanics be able to make apparatus from description? I should like a little more information as to where I could get teeth, tools, etc. [Dentistry is a subject with which amateurs should not meddle, but oftentimes "fools rush in where angels fear to tread." If you wish it, I can put you in communication with the writer of the remarks to which you refer, but I cannot insert any articles on dentistry in this Magazine.—Ed.]

Cheap Lathes.

J. P. (*Staveley*) writes:—I am wanting to buy a small lathe. I should be much obliged if any of your readers would assist me in choosing one suitable. I want one that is adapted for turning and boring light metal-work. There are so many rival makers of machine tools, that it is extremely difficult for me to fix my choice on any particular machine.

S. R. (*Dublin*) asks :—Will any of your readers kindly answer this?—Could an ordinary sewing-machine stand be used for a fret-saw machine? I think it could; and if I had proper instructions how to proceed, I might manage it.

Walking-Stick Gun.

Rustic asks :—Will any subscriber furnish me with drawings for a walking-stick gun?

Weather Vane for Summer-house.

W. J. writes :—Could you give me a design for a windmill and weather vane, to fix on the top of a summer-house?

BRIEF ANSWERS TO MINOR QUERIES.

Amateur and Others. For the present, as much space is devoted to Organ-building as can be spared. Perhaps at some future time the instrument you name may be dealt with.—P. K. (*Henley*). I have some good papers in hand on the subject about which you write, and which will not be lost sight of.—C. D. D. (*Woolwich*). Papers on the subject you mention will be useful to many, and shall be given as soon as possible.

THE VIOLIN: HOW TO MAKE IT.

By EDWARD HERON-ALLEN.

IV.—THE TABLES (BACK AND BELLY).

YOU may now proceed to prepare the wood for the back and belly in the manner set forth in page 169, Vol. I. You will find the maple intensely difficult to join properly, for when squared and held up to the light, no crack showing the light must appear in the join, nor must a fine line of glue appear when the join is finally planed; and to produce this perfect fit in curly wood like maple is a very difficult matter to an unpractised hand, and may therefore be relegated to the professional joiner: for it must be noticed there is only a very small margin to plane away in two halves, each only five inches broad. The belly of soft pine will be found to be easier to join. When joined (as at C, Fig. 26, Vol. I.), the under or flat side of the slabs must be so perfectly truly planed that a straight edge laid across them in any direction will not show any hollows or inequalities in their surface. Now glue on to the sloping sides two strips of wood as at A, Fig. 31, and plane their surfaces parallel, so that the slab may stand on its pointed surface, so to speak, without wobbling; when in this position, take your thin plank outline (C, C, C) with the line (A, B) down the centre, hold it firmly on the plane side of the slab with the line (A, B) coinciding with the join (B, Fig. 31), down the centre of the slab. Then with a sharp pencil or point mark the outline exactly on the slab; when this is done on both deal and maple, cut away all the external wood with the bow saw, leaving the edge a little beyond the marked outline to allow for finer cutting and subsequent finishing. When both outlines have been cut out, remove the remains of the steadying wedges (A, A, Fig. 31), being careful, in cutting them away, not to injure the sloping sides of the slab. Now with the

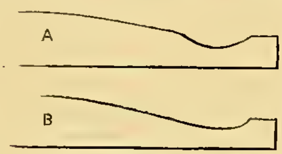


FIG. 33.—STAGES OF FORMING RAISED EDGES OF VIOLIN.

FIG. 32.—CURVE OF ORDINARY CUTTING GOUGE.

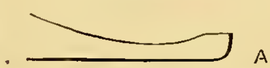


FIG. 35.—SECTION OF EDGE OF BACK.

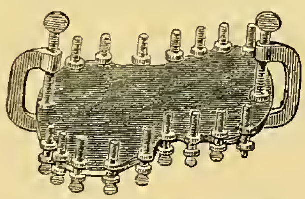


FIG. 37.—VIOLIN SECURED BY SCREWS AND CRAMPS.

gauge draw a line round the edge of the slab $\frac{5}{16}$ inch from the plane side, and with a flattish gouge cut away the wood down to this line, first at the two ends till the centre of the slab along the line A, B, takes the form of the guide represented by the line G, G (*Sup.*, Part 17); then cut away very gradually, till along the horizontal lines drawn across the plate the surface takes the form of the guide pieces shown in the *Sup.*, Part 17. Cut this surface very carefully, especially on the lines 3, 7, and 8, for a cut of the gouge too deep in a wrong place will spoil your work entirely; therefore correct your arching by the guides at their respective places at every few cuts that you give with the gouge. The back will be the hardest, especially as the curls of the wood are apt to break out in grooves if you make a cut the wrong way of the grain. The belly will be much easier; indeed, the difficulty lies in its ease, for it cuts like apple, and the slightest slip of a sharp gouge will do irretrievable damage.

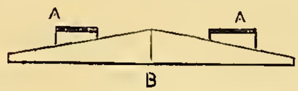


FIG. 31.—STEADYING WEDGES USED IN CUTTING BELLY.

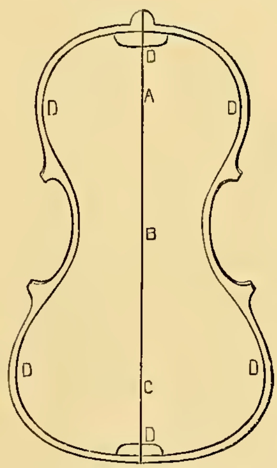


FIG. 36.—DIAGRAM SHOWING ADJUSTMENT OF THICKNESSES OF BACK.

Do not carry this operation too far; leave the gouge marks distinct in the wood rather than try to chisel them away, leaving all finishing of this sort to the planing, which will be described later on. When this is done, take your plank outline and set it well in the centre of the slab, fixing it at either end with a little cramp (Fig. 1). You originally cut out your slabs rather roughly, so there will be a little margin round it; you must now mark with a marking-point the *exact* outline of your plank on to the plane side of your slab, then with a fine, sharp knife remove, absolutely cleanly, all wood outside this mark; this requires much care, for remember you are now cutting the outline of your back and belly finally and as they will appear on the finished violin, therefore cut both of them exactly to the plank outline, and both being exact to the outline, they will be exact to one another.

In marking the outline thus finally, you will see the use of cutting out the position of the sound-post in the plank outline, for of course in marking the back the

sound-post will be on the right, and in marking the belly it will be on the left. This is a point which must be attended to, for in a whole outline taken from a Stradivarius, the two halves will not be found to be in contra-facsimile to one another ; the difference may be infinitesimal, but none the less appreciable in so fine a work as a fiddle.

It is one of the first worries of the beginner that he splits off pieces of the curves of the bouts whilst doing this cutting, owing to the curls of the wood. When this happens the piece must at once be glued on again, and if neatly done, will not show when the work is finished When this is finished, the edges must again be gauged, this time $\frac{1}{6}$ inch from the plane side, and then with a knife cut $\frac{1}{4}$-inch bevel from this line to the rough side, leaving the corners and button thicker. When this has been done, and the edges all round both back and belly, present a uniform thickness of $\frac{1}{6}$ inch, except the corners and button, take a broad flat gouge and slope the rough arching to the gauge line, extending your slope about an inch from the edge all round, according to the intended model of your fiddle. Do this carefully round back and belly, always leaving the corners and button thickest. For this purpose the back or belly must be cramped on to the edge of the bench, so that half of it overhangs. When you have gouged round one half, turn it round and do the other, being careful to have your gouges very sharp, so as not to have to lean heavily on the work for fear of separating the centre join, or other calamity. This done, go all over the back and belly with the broad gouge, guiding your work as closely as possible with the model outlines (*Sup.*, Part 17), but not going too far towards smoothing the surface ; all gouge marks may be left to the plane when the model or arching has been roughly gouged out.

You have now finished with the gouge, and may turn your attention to the first planing. This is done with the toothed oval planes (Figs. 8 and 9), holding the slab with the hand against the body or bench, going over the gouge marks very carefully, holding the plane so that it cuts in a slanting direction on account of the extremely tender nature of the wood, especially so if it is of a handsome grain or curl. Go on thus till the arching guides (*Sup.*, Part 17) exactly fit the places on the back and belly indicated on the Plate, and the wood is roughly levelled over. Be especially careful in planing to fit the arching guides, Nos. 7 and 8 (the entire arching across the centre of the back and belly), to leave plenty of wood, for a bold "breast" is a great beauty in a fiddle.

Throughout the operations of gouging the arching of the back and belly, you will find it a great advantage if you can compare your work with a true specimen of the great master's work, for then you can check the accuracy of your guide slips, and correct any errors which may creep in in tracing them from these pages. When you have roughly planed the back and belly all over, take a smaller plane, and plane them pretty smooth (but without altering the shape), for the distance of an inch from the edge. Then take the spring compass (A, Fig. 10), having one leg just longer than the other, and opening them to $\frac{1}{8}$ inch, set the longer leg against the edge, so that the shorter one just touches the surface of the back or belly $\frac{1}{8}$ inch from the edge like a gauge. Draw in this manner a line all round back and belly $\frac{1}{8}$ of an inch from the edge, being careful to make it steady and even. Now open the compass to $\frac{5}{32}$ of an inch, and draw a second line inside the first, in a similar manner, $\frac{5}{32}$ from the edge. Now take an ordinary cutting gouge, having a curve represented by Fig. 32, and very carefully cut a little trough or groove right round the back and belly, between these two lines, not more than $\frac{1}{20}$ inch or so deep, and being *most cautious* not to cut beyond the *outer* one, which must be left clean and clear. If by any mischance you cut through it, and the thickness of your edge allows it, re-mark the $\frac{1}{8}$ line, and gouge a little deeper to save it. When this is done, take a flatter gouge, and carefully "melt" the ridge formed by the *inner* line into the arching of the back or belly. Fig. 33 shows the two stages of this grooving, which is meant to give the graceful raised edges which characterize a well-made fiddle, A representing the groove cut, and B the groove "melted" into the rise of the belly or back. Now go carefully round these new gouge marks with the small oval plane, and bring the entire surface as smooth as you conveniently can with a toothed plane. You must take care in these gouging and planing operations not to alter the rise or arching of your tables as determined by the arching guides to any serious extent. To a certain extent, it is of course impossible to avoid altering them, so you must now go all over them again with the guides, getting them as smooth and true as you can with the finest-toothed plane. You will most probably find it laid down in any works which go into the subject, that now is the time to purfle the instrument, and without doubt this is frequently done at this stage ; but we shall not purfle till the back and belly are glued to the sides ; for though it is easier to do it now, by doing it later on we can make it coincide with the sides, and correct any little irregularities of outline, which we could not do after the purfling is done.

When the last of your planing is done, you will be ready to scrape. This is the most difficult and important of the operations necessary to be gone through, for on it depends the entire character and beauty of your instrument ; if it is done carelessly or lazily, the marks of the planes and scrapers will be

left on the tables, visible beneath the varnish, the rising edge which you have cultivated so carefully (as in Fig. 33) will be scraped away and destroyed, and in fact your fiddle will have the appearance of a rough Guarnerius instrument, instead of the work being in keeping with the beautiful Stradivarius patterns we have been working on up to now. However, remember *Labor ipse voluptas omnia vincit*. Let all your scrapers be very keen all round the edges, and working boldly and strongly, and very carefully, scrape the whole back and belly all over, using the round side and corners of the scrapers all round the sides and wherever necessary, so that there are no plane marks, gouge marks, bumps, or scratches anywhere visible on holding the slab sideways to the light. Mark that it is important to sit in a good light during this operation, *i.e.*, where the light striking the edge of the back and belly will cast a shadow, and "throw up" any bumps, hollows, or marks.

In this operation you will finally adjust all the curves of the tables, so that the hollows melt into the bumps of the model, and a smooth harmonious whole is the result. The great danger of this process is, that a careless or unnoticed sweep of the scraper will scrape down a piece of your carefully left edges and corners. When by accident you do this, you must re-mark the $\frac{1}{12}$-inch gauge line as set forth above, and try to reclaim your error; but this must not be done unless you have sufficient thickness left round the edges by the first and second gougings. When this operation is completed to your own entire satisfaction (or, better still, to the entire satisfaction of some disinterested party), take a wet sponge or brush, and wet the tables all over, back and front, and dry them again at once with a cloth. You will now see for the first time the true magnificence (if it exist) of your wood. The object of this procedure is to show up any least defect in your work, which must then be corrected again with the scraper; and the process must be repeated till the wetting no longer shows any defects on the surfaces of the table. This takes very little time to say, write, and read, but you will find it is the most difficult and important part of your whole work. Now turn both tables over, and opening the spring compasses (B, Fig. 34), $\frac{1}{3}$ of an inch, draw a gauge line all round the flat surfaces of the slabs, as shown in Fig. 34. This serves as a mark beyond which the gouge must not go, being left to include the edge, the sides, and the linings. Then, with a pencil, mark across the four corners and at the top and bottom the parts of the back which will be glued to the blocks, as shown in Fig. 34, marking them fully large for the present; these places again must not be touched by the gouge, but left quite flat. You are now going to commence what may be called the real operation of fiddle-making, *i.e.*, scooping out the back and belly. For this purpose you must screw a long squared beam of wood on to the bench, about 10 inches from the edge, and in front of it spread a folded cloth. The latter is to place the arched surfaces of the tables upon, setting them against the beam, so as to afford resistance to your gouge. Your work now divides itself into two sections, the scooping of the back and the belly—beginning with

The Back.—Begin by cutting gouge marks roughly right across the inside of the back, about $\frac{1}{6}$ inch deep at the centre line. When this is done, find by means of the compasses the exact centre point of the four corners A, A, A, A, in Fig. 34, which will be found to be A′.* At A′, therefore, dig in the point of the compasses, so as to preserve the puncture when you gouge over it (but not deep enough to affect the *final* thickness), and opening the compasses $2\frac{5}{16}$ inches, draw the circle C C, and then reducing them to $1\frac{3}{16}$ inches, draw the inner circle B B. The first rough thicknesses will be at A′ $\frac{3}{12}$ inch, and at D, D $\frac{5}{24}$ inch. These must be gouged carefully, constantly consulting the gauging callipers (Fig. 13), till this graduation is registered by the scale D as the callipers travel across from D to D. You had better gouge a single scoop right across till these thicknesses are obtained, and this gouged line will serve as a guide. The thickness at present at D, D, will be, in fact, the thickness of the gauged line which, neither now nor in the ensuing processes, must be trespassed upon in the slightest degree. Similar guide lines must now be gouged across the upper and lower bouts, across E E, deepening gradually from the gauge line till the thickness at the centre is $\frac{1}{8}$ inch. You now have three bands (or guide lines) of the (for the present) proper thicknesses across the fiddle; now using your eye and hand together, gouge away between the guide lines till they only form part of the entire hollowing out. Be careful not to get deeper than them anywhere in their vicinity, and *not* to cut into the edge (*i.e.*, outside the gauge line), or into the parts you have marked for the blocks. All the wood inside the circle B B must be $\frac{3}{12}$ inch thick; all within the circle C C $\frac{5}{24}$, and all elsewhere $\frac{1}{8}$ at the thickest part, *i.e.*, the centre; the edges will naturally get cut thinner, owing to the lesser quantity of wood; but to prevent their getting too thin, let the slope from the gauge line to the centre be quite gentle, not an abrupt, downward curve. When this is done fairly smoothly, cutting down the ridges left by the deep gouge marks, as far as it is safe to do so. But do not go too far with

* The *outer* circle connecting the four corners in the figure is merely drawn to prove to the reader that the points A are really equidistant from A′; without it, by an optical delusion, the two *lower* corners seem further from A′ than the two upper.

the gouge, it is a bold weapon ; the plane is not so rapid, but much safer. Take a fairly coarse-toothed plane with a convex plate, and go over the entire inside of the back, smoothing down the ridges left by the gouge, till holding the plate sideways to the light, the only grooves and ridges visible are the little ones left by the plane, and the thicknesses in this, their first stage are pretty well adjusted. Now take a round-edged scraper, very sharp, and proceed strongly to scrape the inside of the back all over, keeping inside the line you gauged round it and the place you marked for the blocks, until the marks of the plane are no longer visible anywhere, and the inside of the back nearly approaches the smoothness of the outside. In this operation you will consult the callipers every moment, finally adjusting the thicknesses till they are as follows : according to Fig. 36, at the point A, $\frac{7}{40}$ inch (*i.e.*, just over $\frac{1}{6}$); at the point B, $\frac{1}{5}$; at the point C, just *a shade* thinner than at A ; at the points D, D, $\frac{9}{64}$ (*i.e.*, just over $\frac{1}{8}$). The thicknesses must merge into one another without any bumps, the wood being a shade stronger in the upper than in the lower bouts, and similarly a shade stronger just where the sound-post will be set ; the edges and parts touching the blocks must be left quite flat (in fact, not touched since the exterior arching was modelled). These, then, are exactly the correct thicknesses for a *new* fiddle-back. When they are properly adjusted, take a good biting file, and bevel very slightly round the whole inside of the edge, using a round one where the short curves render it necessary, and a flat one everywhere else ; finish off this little bevel (which must only be just enough to blunt the angle formed by the inside of the edge and the thickness of the edge) with medium sand-paper, so that it presents (in section) the appearance of A, Fig. 35. The edge left in scooping out the back will by this time be pretty clearly defined by the dirt which accumulates on it (never being touched in all the foregoing operations). Now take a keen, flat-edged scraper, and carefully scrape it clean, being cautious not to alter its planeness of surface. Finish the cleaning with a flat file, which must be passed round the edge very true, to avoid rounding it in any way. Your back is now finished (except the purfling), and it will be found that it gives a note *about* two tones higher than the belly scooped out and the *ff* holes cut, but without the bar. If you turn to page 211, Vol. I., you will see that the addition of the bass bar to the belly will raise the note a tone, which will establish the proper interval (viz., one tone) between the back and belly. The back is now finished, and ready to glue on to the ribs. You will remember that these are resting finished in their mould ; take them out carefully, for if they have warped at all, they run a danger of splitting ; and turning them bottom-side upwards, go round them carefully with keen flat file, to thoroughly clean them and the blocks.

These last having the edge (as it were) of the grain exposed by their cutting, you must size them in the following manner : Spread a coating of glue all over the ends of the blocks, which will be fixed to the back, and put an iron (a poker will do) into the fire to get hot ; when the glue has nearly set, apply the iron to the coating of glue (which must not extend beyond the blocks over the sides and linings) rubbing it lightly so that all the glue is burnt and caked over the ends of the blocks in a brown mass. Now with a flat file rub off all this burnt mass (but do not file down the blocks), and the tops of the blocks will be found to be no longer rough and porous, as would be natural with wood cut across the grain, but hard and smooth as ivory. Unless this precaution were taken, the single coat of glue with which you fix the back to the sides would sink into the blocks, which in course of time would consequently become unglued. This operation being completed, you must proceed to fit your ribs on to your back, which is done with fiddle-screws (Fig. 37) in the following manner. When you place your ribs on your back you will find that the two do not (or rather do not appear to) coincide at all. This is only the natural effort of the bent wood to regain its equilibrium ; you must therefore place the ribs on the back and making one corner fit, fix it with a screw (Fig. 16). Turn the back round, and fit and fix the opposite corner in the same manner. Get the four corners of the ribs thus fitted on to the back by placing two screws at each corner, one on each side. N.B. Never fix a screw *on to* the corner itself, it will infallibly bring it off. Now fix the top and bottom, so as to have a margin equal with that at the corners, by means of iron cramps fixed to the blocks ; the back and the belly ends of the blocks must be protected in the ordinary manner by means of little pieces of wood from the hard pressure of the iron.

Many, indeed most, of the old makers were in the habit of securing the table, to begin with at top and bottom by thrusting a bradawl right through the top and bottom into the block, the hole made by which had subsequently to be filled with a peg. Many modern makers also pursue this practice, but it is undoubtedly better to secure it at these points with a cramp, as above described, and then if you wish to put in pegs it may be done as will be described further on, or not, as the fancy takes you. Then proceed to fix the ribs similarly all round by means of as many screws as can be set round them, as in Fig. 37 you will find twenty-six are required, four for each upper bout, three for each inner bout, and six for each lower bout ; but these numbers may vary with the size of the screws. In the figure, for the sake of clearness, the

screws are represented too few and too far apart. The object to be attained is the keeping of an edge of even width all the way round, and you must screw and unscrew fit and refit, till this is attained.

The ribs being thus fitted to the back without glue, the next thing is to glue and refasten them. For this purpose it will not be necessary to entirely unfix them, but two or three screws may be taken off at a time, and that bit glued and refastened before going on. Begin by taking off the top cramp and three screws on each side; take an old table knife, and dipping it quickly in the glue, insert it between the back and ribs, and run it round as far as it will go, repeating the operation till all you can get at is thoroughly glued; then, seeing that the ribs are rightly set on the edge cramp and screw them up again tight. Take off three or four adjacent screws, glue that bit and refix it, and so on; go all round the fiddle a bout at a time, taking care to reset the ribs, so as to leave an even edge. Then take a brush and with hot water (out of the glue pot) thoroughly wash away all traces of glue clinging outside, inside, or on the edges of the ribs or back. Set the whole arrangement to dry for a day. Your principal difficulty will be that the hold taken by the screws being rather precarious, whilst you fix one another will drop off, and so on, and this is damaging both to the temper and the success of the operation. Therefore fix your glued ribs quickly, *but* carefully and surely. When sufficient time has elapsed for the glue to have dried thoroughly, take three qualities of sand-paper (the last being very fine indeed) and thoroughly sand-paper and smooth the entire inside of the ribs and back: remember that in some centuries when your fiddle is opened, it will not be pleasant to think that the work you have been so careful over outside is slovenly inside. You can now put in your ticket or label. Every violin made ought, to my mind, to be ticketed with the name of its right maker; for preference in Latin, but of course this is optional. The place for the label is discovered by temporarily putting the belly on, and looking through the left hand *f* hole; in this way the most visible place for the label is ascertained, and on this spot it may be glued firmly at once.

Whilst considering the construction of the ribs of the fiddle, I pointed out that if the join at the bottom is not all that might be desired, any deficiency may be hidden by means of a row (or more) of purfling. If the join is *perfect*, *i.e.*, close, straight, and coinciding with the join down the back, so much the better; but if a line of glue marks it, or if it is crooked, or if it is too much one side of the join of the back, those faults may be rectified (without being ashamed of the expedient) in the following manner: Take a few inches of ready made purfling (such as can be bought at a penny a foot at any fiddle maker's) and cut with a sharp knife and lining chisel, a rectangular groove, at exactly right angles with the back, on the site of, and broad enough to cover any fault that may there be found. Cut it a little shallower than the depth of your purfling, and according to the diameter of the latter glue into this groove, one, two or three strips of purfling. These ready made strings may always, if necessary, be thinned by hammering the sides lightly, or broadened by hammering the top.

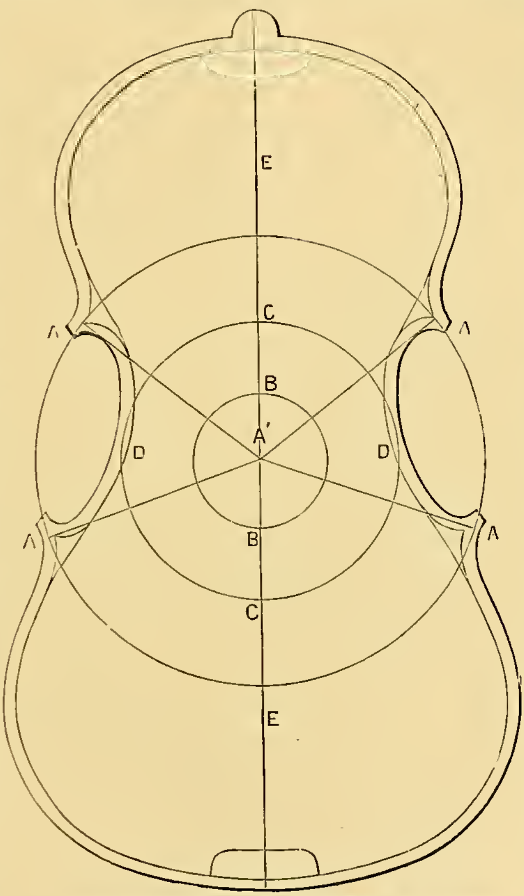


FIG. 34.—DIAGRAM SHOWING METHOD OF SHAPING BACK OF VIOLIN.

This ornamentation without impairing the fiddle, will effectually hide any fault which is apt to be found at this point. Cut off the ends flush with the belly side of the ribs, wash off all superfluous glue, and with a knife or scraper, when this inlaying is dry, level it down flush with the ribs. Now in the exact centre of this line bore a small hole ($\frac{1}{8}$ inch in diameter) which will serve as the *commencement* of the hole for the tail-pin. This is not *finally* cut till the varnishing is

finished, but it is best to *begin* it now, as the belly being off you can guard against the drill splitting away bits of the lower block, which cannot be obviated or corrected when the belly is on. It must not be finished now, or the varnish running into it will make it messy and inconvenient to work with. Your back and sides are now finished, and it remains, therefore, only to glue on the belly, for the body of your violin to be finished " in the white."

(*To be continued.*)

RELIEVO MAPS AND THEIR CONSTRUCTION.

By JOHN BRION,
Constructor of Relievo Maps to H.R.H. the late Prince Consort.

IV.—EMBOSSING AND MOUNTING.

WE have now reached the important stage of embossing. Being provided with a sufficient number of the maps which you intend to emboss, and having traced and properly soaked them, as previously directed, lay upon a bench or table a piece of thick felt or carpet, doubled so as to form an even bed. Upon this place your die, face upwards. With powdered starch, in a muslin bag, lightly dust both its plane surface and its depressions. Lay a wet map, half cut through at the highest elevations with your blunt penknife, and cleared of all surface moisture, accurately upon the register points of the die, as already described, secure it by the paper slips at the edges. Dab the smallest depressions firmly down with a piece of wet cloth formed into a convenient ball. Lay the fractures along the lines of the deepest depressions of the map carefully in their places, and repair them with white paper in the same manner as you did in taking the first proof. Smooth all down neatly. Pass your paste-brush lightly but thoroughly over the entire map, and upon it smoothly mount a damp sheet of ordinary demy paper, previously pasted. Press this down into the depressions; then take your gutta-percha "force," dust it well with the powdered starch to prevent it sticking to the map, and fit it to its proper position on the die. A couple of points will enable you to do this securely. The Cumbrian group and Snowdon, being deep, well-defined depressions, will serve best. If to these you add Beachy Head or Dover Cliffs, you will have a third tie, not to be despised. Press the " force " firmly down upon the map. Rub a piece of soap over the back of your "force," and with the face of an auctioneer's hammer, or a porcelain knobbed door-handle (the latter makes an excellent tool) rub with considerable power over the whole of the back of the " force," crossing and recrossing your rubber in every direction, so that every portion of the map beneath may receive the impression of the die and force. Be most careful not to *strike* your die, for although it will bear a very considerable exertion of strength when *rubbed*, it would go to pieces under a very moderate blow, or beneath a press. This rubbing process is the secret which has enabled me for many years to dispense with metal dies and all kinds of presses, and by it I have produced much sharper work than I ever obtained by stamping, screw, or hydraulic power ; and it is this which will enable both the amateur and professional to dispense with the founder and electrotypist, as well as with costly machines of every kind. When I state that I have used Parian dies of various sizes, from four inches square up to four feet, without experiencing a single breakage, I think the reader will admit that their utility is sufficiently proved.

NOTE.—The best method of obtaining power in rubbing is to firmly grasp the handle of your auctioneer's hammer, or the spindle of your door-knob, and bring your hand, in that position, near your chest, throwing back your elbow, and rubbing "straight from the shoulder." Take especial care that your die always lies on a thick and even pad of felt or carpet.

Remove your force cautiously. Examine the impression made upon the back of the embossed map. If not satisfactory in all parts, return the force, and give what is technically termed a "second blocking." This is also the time for using the portions of the force that may have been taken to make good defective parts in the entire one. After a little practice, ease and rapidity will be obtained.

It has been the practice of Keller and Dobbs to leave the backs of their embossed maps hollow, and to wash over the depressions with glue, or shellac in solution. I have always chosen to fill in the embossing solid with papier-mache, and recommend the same to all who care for securing solidity of work. For small maps, the papier-mache may be made according to the method already given ; but if the work be larger, blotting-paper will be too expensive, and the soft, unsized straw-paper, like that in which grocers usually wrap sugar, will be found a good substitute. Soak this to pulp, in water; squeeze dry ; add strong size or weak glue, well warmed, to enable you to mix the mass into a paste of about the consistence of stiff putty. If you think fit, one-third of the composition modelling clay (whiting and flour) may be blended with this. Press the papier-mache firmly into your embossed work, and smooth off the whole to a level. Take especial care not to leave a speck upon any portion of the sea, or you will deface your map.

Embossed maps are mounted in three ways :

1st, upon thin panels of wood; 2nd, upon millboard; 3rd, upon canvas strained upon a stretcher. No. 1 is very objectionable, as the panel is liable to warp while the embossed work is drying. No. 2 is far preferable; but when used, it is necessary to tack down the edges of the millboard, and several points in the land, to a thick board or floor, to prevent the work from rising in an unsightly manner while drying. No. 3 is free from these risks and objections, is cheaper and easier to work, and ensures the perfect level so necessary to the correctness of relievo work.

In preparing the canvas mount, No. 3, make or obtain deal stretchers of the size of your map. Any ordinary carpenter will supply you with 18 by 21 inches, at about four shillings per doz., and so on in proportion to the size. Be careful not to have the corners of these "*mitred*," or probably they will "twist." "Halving" or "dowelling" should be employed. The former is easiest, and quite effectual, when properly done. A word or two of instruction thereon may be useful.

Let A, B, C, D (Fig. 15) be slips of well-seasoned half-inch deal, one and a half inches wide, 21 and 18 inches long, with the ends cut true at right angles.

With the same length *b a* (on slip A) as it is at *b c* make a fine saw-cut, *a d*, half through the deal, and strictly parallel to *b c*. Saw away the portion, *a*, *b*, *c*, *d*, so as to leave exactly half the thickness of the slip remaining. Do this to all the slips, as shown in the shaded parts of the sketch. When found to fit accurately, glue them well, and with four brads at each corner, and a T square to regulate your work, bring them together in a frame as in Fig. 16.

This species of stretcher stands well.

Procure stout calico, or thin canvas, if you prefer it, free from knots; cut it into pieces, an inch wider all round than the stretcher; lay one piece of this upon a board or table, place the stretcher upon it, cut off the corners of your canvas or calico, as in Fig. 17, flush up to the stretcher.

Run your brush, with good glue, around the *back* of your stretcher, and pull your calico firmly down upon it, securing here and there, if needed, by small tacks, *not to be driven home*, but removed when the glue is dry. Avoid putting glue upon the front edge of the stretcher. This method I have found to be easy and in every way satisfactory.

With the calico or canvas strained upon the stretcher, let us proceed to mount our embossed map.

Paste the face of the strained calico thoroughly, also the back of the embossed work. With care and exactitude lay two corners of the mounted stretcher upon two corners of the map, let it gently fall into its place upon the relievo, rub the back of the calico or canvas well and evenly down upon the map so that every part may adhere, remove the side pieces of binding paper, raise the die to an almost perpendicular position, and gently lift the embossed map. Examine the work in order to ascertain that the hills or mountains have not been driven aside during the separation. If any such accident has occurred, it may be easily remedied, as all is now damp and plastic, by gently modelling the injured part into its proper place or form. If anything of this kind be now overlooked, it will give ten times the trouble to alter when all is hard and dry.

The drying of an embossed map is a matter of no difficulty, but it nevertheless requires a little attention. In the first place, the work must not be hurried by placing it before a fire or beneath the rays of a hot sun. That will cause warping or shrinking. On the other hand, if allowed to remain too long in a damp condition, it will mildew or rot. A moderately warm room is needed. The period required for drying varies according to the size of the masses of relievo work. For small maps twenty-four hours may be named; very large and bold subjects require three or four days. During the first twelve hours it is well to let the embossed work lie in a horizontal position, face upward, supported beneath by a panel of wood of proper thickness to prevent the map from sinking. When set, the relievo may be advantageously stood on edge so as to allow of its drying equally at the same time, back and front. In working upon large numbers, a drying frame, constructed like a plate-rack, will enable you to deal with many in a small space.

Our description of the process of embossing has taken a long time, but let not the reader therefore suppose that the operation is necessarily lengthy or tedious. With all materials ready to hand, I have, with one assistant, easily embossed and mounted ten copies of maps, 24 by 21 inches, within the hour. Ten minutes to a quarter of an hour per copy, I would name, as the average time required for a moderately skilled hand. But if an hour, or upwards, be consumed upon carefully working up proofs, or early copies, do not consider the time as misspent. "Accuracy first, speed afterwards."

If the embossing has been well done, the fractures on the tops of the hills and mountains will be scarcely perceptible, the paper beneath having been "blocked" in so as to blend with and hide the rents in the map. Most persons suppose on looking at a well-executed relievo map, that by some secret process the embossing has been effected without breakage of any kind. It is not so. True it is that suitable paper may be embossed to a considerable depth, intact. I have, in some species of undulating work, "blocked"

to a depth of an inch and a half without breakage, but in craggy, abrupt subjects, it is rare to obtain more than an inch in depth, perfect. The expedient of backing up the rents during the process of embossing, with paper of like colour and quality, and "blocking" it thoroughly into the substance of the map, renders fractures things of small consequence to the constructor, yet it is here that he assumes the greatest mystery; and who shall condemn so innocent a reticence?

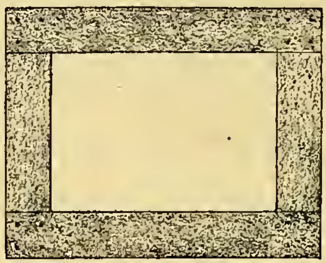


FIG. 16.—STRETCHER TO TAKE CALICO.

Suppose the relievo to be thoroughly dry, before troubling yourself about any perceptible fractures, dust the map carefully and, with a soft hog-hair or flat camel-hair brush, wash it lightly over with patent, or other clear size, which may be procured of oilmen and colourmen. If size cannot be easily had, it may be made of isinglass, pale gelatine, or by boiling parchment cuttings in an enamelled or well-tinned saucepan over a slow fire for about an hour, taking off the scum as it rises, and straining through a thin cloth when done. Isinglass is too expensive save for very small work. In sizing, take care not to let your liquid settle down into pools amidst the hills, etc., and go very carefully in cross action over every portion of the sea as well as the land. Stand aside to dry.

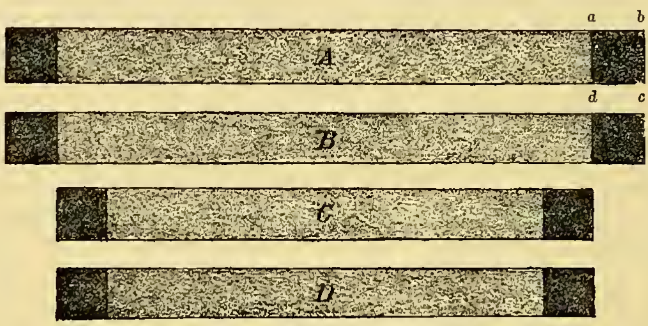


FIG. 15.—SLIPS FOR FRAME FOR MOUNTING MAPS.

NOTE.—The size should be reduced by hot water to the consistency of very thin cream, and be applied while warm. When dry, it will be found that most of the fractures on the embossed work have disappeared; if any remain, they may be repaired thus: Take a small quantity of finely-powdered Glenfield white starch, mix it to a creamy paste with warm size (avoid using gum Arabic instead of size, as it causes brittleness and discolouration); keep the starch cement liquid by placing the cup or other vessel, containing it, over a basin of warm water, while working. Go over the fractures with a camel-hair pencil dipped in the liquid starch. This is as easily done as the touching in of the high lights in a water-colour sketch, and with very little practice, may be so effectually performed, as to baffle the nicest scrutiny.

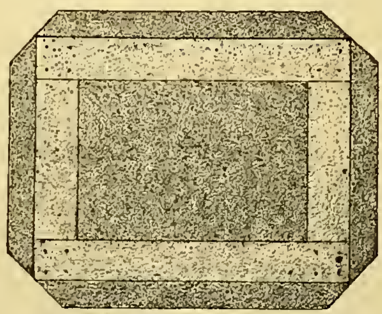


FIG. 17.—CALICO CUT TO FIT STRETCHER.

This "touching in" being completed, and all quite dry, proceed to colour your relievo. Good, cheap pigments for this purpose, are to be had in moist water colours, prepared by Reeves and Sons, London, and sold in little tin pans at a penny each. In variety of tone, purity, and freedom in working, these little, unpretending articles are far superior to the hard cakes at one and two shillings each, that were our only vehicles twenty years since. All ordinary colours, both simple and compound, are included in Reeves' series. Provided with a dozen of them, say:—

Crimson Lake, Cobalt, Gamhoge,
Burnt Sienna, Prussian Blue, Roman Ochre,
Burnt Umber, Neutral Grey, Brown Pink,
Hooker's Green,
Green Bice,
Sepia,

and four or five camel-hair pencils, varying in size from the crow-quill to the swan-quill, prepare your colour by taking a little of that, which you intend to use first, from the pan and mixing it with water in a plate or saucer to the requisite depth of tone. Suppose we begin with *crimson lake*, and at Northumberland. Carefully cut around the boundary of the county with your small pencil; then, with a larger one, well charged with colour, work quickly from the fine line towards the centre, taking especial care to keep sufficient colour on the part you are engaged upon, to preserve it in a thin float. When the county is completely covered, quickly take up the redundant colour with one of your large pencils, being careful to remove the little pools of colour which are certain to form in the valleys and other depressions. Northumberland finished, pass on, with the same colour to Suffolk, Kent, Hants, Isle of Wight, Gloucester, Devon, Pembroke, Merioneth, Lancashire. Do not throw away your *lake*, as it will be needed again presently, but in another saucer, mix *burnt sienna*, and

with it colour in Lincoln, Middlesex, Oxford, Somerset, Hereford, Carmarthen, Anglesey, Cumberland. The *yellows* may now follow in Durham, Essex, Sussex, Wilts, Monmouth, Cardigan, Carnarvon. With *greens*, in Yorkshire, Norfolk, Dorset, Cornwall, Glamorgan, Denbigh, Isle of Man; and *light greys* in Flint, Westmoreland, and *Roman ochre* in Cheshire, we have completed the colouring of the maritime counties. The inland divisions remain. I find the following to blend well, and at the same time to produce a distinct effect, but, of course, the constructor will exercise his own taste in this as well as in other points.

Yellows.—Nottingham, Salop, Warwick, Beds, Wilts.

Lakes.—Leicester, Huntingdon, Bucks, Brecknock.

Greys or very Light Blue.—Derby, Rutland, Surrey, Cambridge.

Greens.—Stafford, Radnor, Hertford, Northampton.

Burnt Sienna.—Montgomery.

The part of Scotland may be tinted with pale Roman ochre; part of Ireland with pale green; and France with pale sienna. It should be borne in mind that no attempt must be made to colour an adjacent county until the one previously tinted is perfectly dry, or the result will be a blurred boundary line. It must also be stated that very pale or very strong colours should alike be avoided. Whatever variation you may make in the foregoing table of colours, it will be all important to strive to make your tints harmonise. Greens and blues should not be in juxtaposition, but broken by the warm tones of lake and sienna, etc. After a little practice the constructor will be able to arrange his own palette independently when he will find that almost as great a variety of effects can be produced upon a relievo map as upon a picture.

The colouring done and dried, give the map a second coat of siz of somewhat thinner consistency than the first; and after an interval of a few hours give it a third coat, in every case being most particular not to miss a single point, otherwise the varnish, which has to follow, will penetrate, and create an ugly brown mark.

The last operation, namely, that of varnishing, remains. Provide yourself with a soft, round hog-hair brush of about three-quarters of an inch in diameter, and with a sufficiency of ordinary paper or map varnish; this may be used in its simple state, but I have found it to be very greatly improved, both in hardness and brightness, by the addition of one-sixth part of white hard varnish, and still further by the admixture of one large teaspoonful of "terapin" with a quart of varnish. This combination is best effected by pouring the "white hard" and the "terapin" into the bottle containing the paper varnish and shaking well and often. If you allow it to stand in a moderately warm place for several days before using, it will be advantageous. The admixture stands well. I have before me works varnished with it, and which, without the advantage of the recent discovery of "terapin," have borne twenty years of constant exhibition in South Kensington Museum, unglazed and uncased, and are now, after a simple sponging with pure water, as clear and bright as when first placed there.

Let the varnishing be done in a warm room, with doors and windows closed, or currents of air may cause your work to become "ridgy." Warm the map and varnish slightly before a fire; take care that the former is perfectly dry and well dusted. Pour a sufficiency of varnish into a saucer, or other convenient vessel; work your brush well into it before applying it to the map, but take care not to agitate it into froth; then, commencing in the centre of the map, by a few speedy strokes cover the whole of the surface. Avoid, as far as possible, passing over your work repeatedly, as your varnish will quickly set, and then a second coat may cause it to "clog." Should such a dilemma occur, gently wash off the offending portion with a piece of clean rag dipped in turpentine, and after a few minutes varnish again cautiously. If any defects are now observed, either in colour or fractures, they may be remedied when the first coat of varnish is dry by touching in the objectionable parts with opaque oil colours to match what you require. Those sold in tubes by artists' colourmen are best adapted for this work. In about twenty-four hours a second coat of varnish may be given, and in forty-eight a third coat will give additional brightness and durability that will well repay the trifling extra cost and labour. Do not lay your varnish on too quickly, or it may run into unsightly waves in drying. Three thin coats are far preferable in every way to two thick ones. After varnishing, cleanse your brush thoroughly in turpentine. Paste and size brushes should be washed in warm water when done with.

Our relievo map is finished. A suitable frame will greatly enhance its appearance. Rosewood, walnut, or maple, with gilt moulding, or simple oak, of the Oxford pattern, may be named as well fitted for the purpose.

It is almost needless to say that geological or other models may, by the foregoing methods, be reproduced in papier-mache, and coloured to any taste. A sheet of fairly stout demy paper (not cartridge or any highly-sized brittle paper) will, in embossing such work, be used instead of the map we have been working upon. This is the only variation that need be noted.

Many specimens of embossed maps may be seen at the reading room of the British Museum. *Vide*, map catalogues: Keller, Dobbs, Brion; also on application to the librarians of the Royal Geographical and Geological Societies, London; and at the School of Mines and Geological Museum, Jermyn Street. A glance at these will convey more to the mind in a few minutes than can be effected by the most careful description in a day.

RUSTIC CARPENTRY.

By ARTHUR YORKE.

III.—LINING THE ROOF—LARGE AND COMMODIOUS SUMMER-HOUSE—RUSTIC MOSAIC—BARK LINING—FLOORING.

LINING THE ROOF.—The under side of the thatch, as seen within the building, has, if left exposed, a cold and unsightly appearance. It requires lining, and a material which has long and deservedly been most in favour for this purpose is ling, or common heather. This is pleasing in colour, and has generally a cosy effect. It is arranged, so to speak, like an internal thatch: Fig. 13 illustrates the manner of fixing it. A layer of ling is laid at the bottom of the thatch, with the brush ends downwards to the wall-plate. A strip of wood is then nailed tightly over the root-ends, from rafter to rafter. This fixes the ling in place, and then a second course is laid, overlapping it and concealing the strips of wood; and so on till the whole space is lined.

If ling is not to be had, other materials may be used as substitutes. The ends of fir branches look very pretty, but after a time the narrow leaflets have a tendency to drop off. Perhaps a better substitute is furze, which is to be obtained everywhere. This dries to a light, but not disagreeable brown colour, and there is not the slightest danger of its spikes ever falling. It is, however, an ugly plant to handle, and before meddling with it the worker will do well to provide himself with a stout pair of hedging gloves.

These materials can scarcely be said to possess a market value. Wherever there are heaths and commons, furze or ling are to be had for nothing. Their cost will be merely that of cutting and carriage.

Failing any of these, a lining of moss will be found pretty, though not very enduring. Such a lining will want renewing about every fifth year. Moss is very liable to suffer from the visits of birds, which in winter pull it about in their search after concealed insects, and in spring regard it as so much suitable nest-building material. Moss may be collected anywhere in thickets and poor pastures, and can be fixed to the thatch by small buckles of twig. For the same reason that outside buckles are directed upwards, these must have their points inclined downwards.

A summer-house of still larger dimensions is given in Fig. 14; and this is so arranged as to be more completely secured from wind and weather, and at the same time more thoroughly screened from the heat and glare of summer. Its measurements are—height to eaves, 6 feet; end to end, 12 feet; and back to front, 8 feet, exclusive of the porch, which is 3 feet square. Fig. 15 is a ground-plan of this building.

Unlike that in the last example, the breast-work along the front of this house is made close and weather-tight. It is constructed much in the same way as the walls of the small house—that is to say, of the halves of small larch poles. On the inner side, an ornamental arrangement of pieces—something like that on the outer side is supposed to exist. Round the windows above, a border of open-work, of rough oak or other branches, has been carried. In the centre of the house the position of an octagonal table has been indicated.

In its main features the construction of the roof is much the same as that last given. The only point which can call for explanation, is the method in which the ridge-piece of the porch is carried. From two rafters, which run from the top of the two inner pillars of the porch, a cross-piece is thrown at the same height as the top of the pediment. This supports the inner end of the ridge-piece, as well as the lower end of a short rafter running up to the main ridge-piece of the building.

The walls of this summer-house may be formed by either of the two methods before described; or, for the fuller information of the reader, we may consider them as somewhat differently constructed. In a general way, for strength, durability, appearance, and cheapness, larch poles, either halved or whole, are unequalled. Yet it may so happen that the amateur builder has a quantity of boards by him; or that, for other reasons, he may prefer that material. These can, of course, be nailed to the cross-pieces, as above described, more quickly and regularly than halved poles, and will form an admirable ground for the inside lining of wood-mosaic, or bark, whichever may be employed.

If the summer-house stands with its back to the boundary of the garden, or is completely flanked by shrubs, the outward appearance may be a matter of no moment; yet boarded walls may readily be rendered decorative, and a good hold given for creepers, by nailing against them a random arrangement of rough pieces of branch. An excellent material for

this purpose, and one which since it is flat, can be attached with little trouble, is ivy. When ivy is cut down from trees, or old walls, we see a perfect net-work of interlaced stems. These may be taken down in flakes of suitable size ; and when nailed in position have a highly grotesque and characteristic appearance.

Rustic Mosaic.—An important feature in rustic work is the mosaic of small split rods which forms the most finished lining for summer-houses, and covering for seats, etc. Of this I have as yet spoken only incidentally, and the present will be a proper place in which to deal with it more fully. In this manner elaborate and beautiful patterns may be formed, in which the colour of the wood may be made to play its part as well as the direction of the pieces. In this work the amateur of taste will find scope for his ability in arranging the glossy brown of the hazel, the silver-grey of the birch, and the white of the peeled willow, to the best advantage.

In Fig. 15 I give a design for a panel in this work, which might properly be employed in the lining of the present summer-house. Fig. 16 represents a portion of the decoration of a seat, well suited to accompany it.

If fine rustic mosaic has to be worked on halved larch poles, the latter need to be fixed with much smoothness and accuracy. Simply considered as a ground on which to nail fine work, a boarded wall has undoubtedly the advantage.

When the split rods are required in quite short lengths, it may suffice to rend them through with a hatchet. Woods of loose grain, such as willow, when free from knots, will often rend with something like truth for three feet or more. But, generally speaking, rending is a dangerous experiment. It is safer to run the rod through with the saw. The thin rods used may quickly be split with a sharp hand-saw. A good method of holding the stick tightly and in a handy position whilst it is sawn, is to knock together a couple of rough benches—say about 18 or 20 inches high—and in the top of each to cut a square notch, rather broader and deeper than the rods. If the stick is laid in these notches, and wooden wedges driven in beside it, it cannot stir. The wedges can be knocked in or out in a moment, whenever it is necessary to readjust the rod.

A punch should be used for driving home the brads employed to fix the strips in their places ; since, if this is done with the hammer alone, the bark is sure to be bruised, and the work disfigured.

Rustic mosaic is both improved in appearance and rendered more enduring by being varnished. The cheaper kind of oak varnish is generally used.

Bark Lining.—Another method of lining summer-houses, and a much more expeditious one, is by making use of bark. Elm bark is best. It will be found to run easily from newly-felled trees, cut down when the sap is rising. It can be taken off in sheets of convenient size, and should then be laid on the floor of a shed to dry. It must be spread out flat, which will require doing with some care, as it cracks easily ; and bricks or something of the kind must be placed on it to keep it flat till dry. Flat-headed nails are best for fixing it in position, and the joints between the sheets, and any cracks which may open, can be neatly filled with moss. The appearance of bark thus treated is exceedingly rustic and very pretty, but it will not stand like mosaic. It will always have a tendency to cockle and crack, and when pieces break out it is not easy to mend it neatly. Perhaps its greatest value is for lining beneath seats or along the upper parts of walls, where it will be little exposed to injury, and where any defects will not easily be seen. In such situations the labour of fitting an intricate mosaic would seem thrown away.

Making Walls Wind-proof. — Wherever our roughly-constructed walls have chinks or crannies, they should be stopped with moss. The moss should be dried for a few days before being used, and should be tucked in as tightly as possible with a wooden spud. So much of the moss as appears will have rather a pretty effect than otherwise ; and, if the work is well done, the walls will be rendered perfectly air-tight.

Flooring. — In gravelly districts, where pebbles abound, a dry, sound, and lasting floor may be made with them. A bed of broken stones, coarse gravel, or rubbish should first be laid, and over it a layer of sand, in which to set the pebbles. The sand should be a couple of inches deep, and the pebbles may quickly be fixed in their places and brought to a level surface by tapping them with a mallet. More sand should afterwards be spread over and brushed in between them. If pebbles of various colours are to be had, an ornamental mosaic may be formed by disposing them in a geometrical pattern.

If the situation is one in which there is any cause to fear that damp will rise, a layer of fine washed gravel, mixed with gas-tar, may be laid below the pebbles.

Some persons—ladies, for instance, who wear thin shoes—object to pebbles, as being hard and cold. To such persons a wooden floor will be best suited. A boarded floor is not proper to a rustic summer-house. A wood-pavement, at once ornamental and practically all that can be desired, may be made of lengths of round wood, ranged endwise. Nothing is better for the purpose than pieces of larch pole, about six inches long. These can be kept flat at bottom, and set in sand like the pebbles ; but this will

necessitate that they should be quite equal in length, and carefully laid. A quicker method is roughly to point them at the lower end, and to drive them into the natural soil with a mallet; in this case, any little irregularity in length will not matter. It is easy so to arrange the pieces as to make them form some kind of pattern. The spaces between them should be filled up with sand.

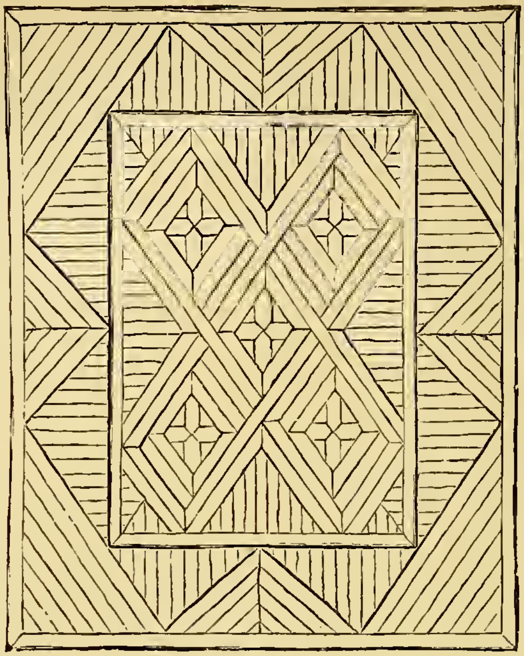


FIG. 16.—PANEL OF RUSTIC MOSAIC.

If the purse or patience of the builder will extend no farther than to a floor of mere gravel, he is advised, above the first and second beds of broken stones and coarse gravel, to lay one of that cheap and ready substitute for asphalt mentioned above, namely, of fine washed gravel and gas-tar. Above this, and hiding its unsightly dark colour, a little fine gravel must be sifted. This will at least secure a dry and a warm floor, and one as little dusty as possible. But dusty, more or less, and obnoxious to ladies' dresses, a gravelled floor in a summer-house will always be.

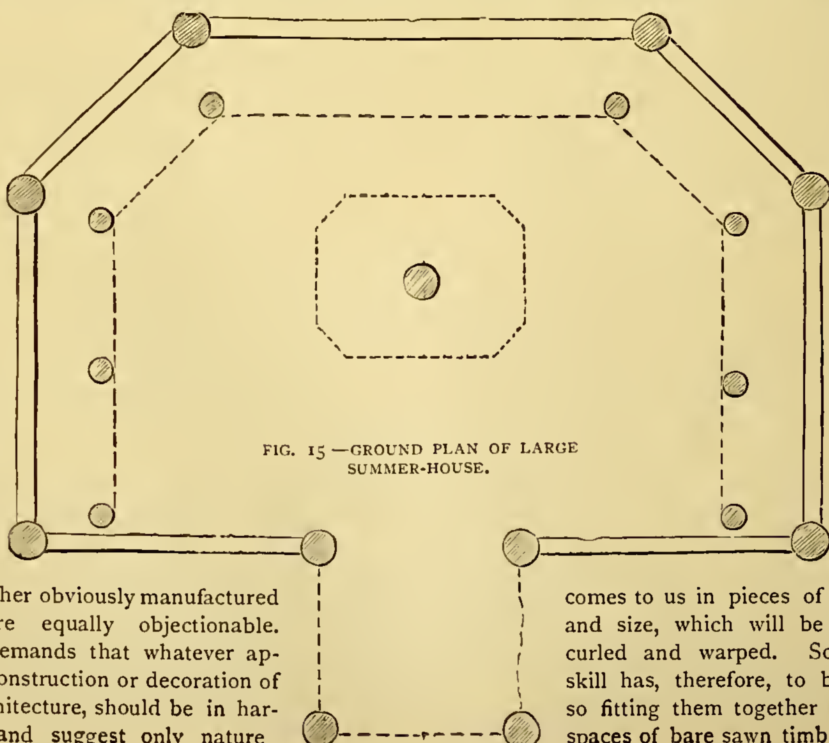


FIG. 15 —GROUND PLAN OF LARGE SUMMER-HOUSE.

I have above objected to board as a material for flooring; and I may here remark that tiles, or any other obviously manufactured substance, are equally objectionable. Good taste demands that whatever appears in the construction or decoration of our rustic architecture, should be in harmony with, and suggest only nature whatever is suggestive of artificial life is therefore to be avoided.

Among the materials mentioned above as proper for the lining of summer-houses, that well-known substance in garden decoration, virgin cork, was not named. Since, however, it is a material which is sometimes easily to be obtained when others are not, and as it is decidedly effective, some mention ought to be made of it. Still there is an objection to cork in point of taste. It has become, to a certain extent, vulgarised. We see it so frequently in feeble town and suburban decorations that the mind connects it with "cockney" associations. Such associations it is desirable to avoid in our rustic-work. Cork may be nailed upon the walls as a lining in the same way as the bark of English trees, and like such bark it will be better if the use of it can be confined to those parts where it will not be exposed to much wear and tear. It will not be possible to get it in fine large flat sheets, such as the operator can himself peel from newly-felled elm trees. It comes to us in pieces of irregular form and size, which will be more or less curled and warped. Some care and skill has, therefore, to be exercised in so fitting them together as to show no spaces of bare sawn timber between, for

if such spaces are left exposed the effect will be anything but good. Whatever crannies remain between should be neatly filled with moss.

This cork is the bark of the *Quercus Suber*, a kind of oak, which grows principally in the Spanish peninsula. It is sent thence to this country in great quantities for various purposes. It is the outer bark only, and

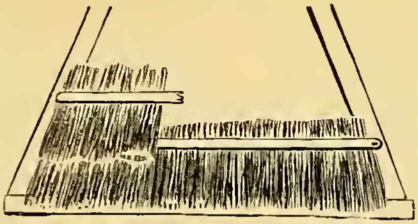


FIG. 13.—LINING WITH LING.

ferneries and rough work than for careful rustic carpentry; but in suburban districts, where larch poles and bark suitable for this purpose cannot be obtained as easily as in the country, it will serve as a substitute for lining the interior, and even covering the exterior, of small structures to which it is sought to impart some appearance o rustic work.

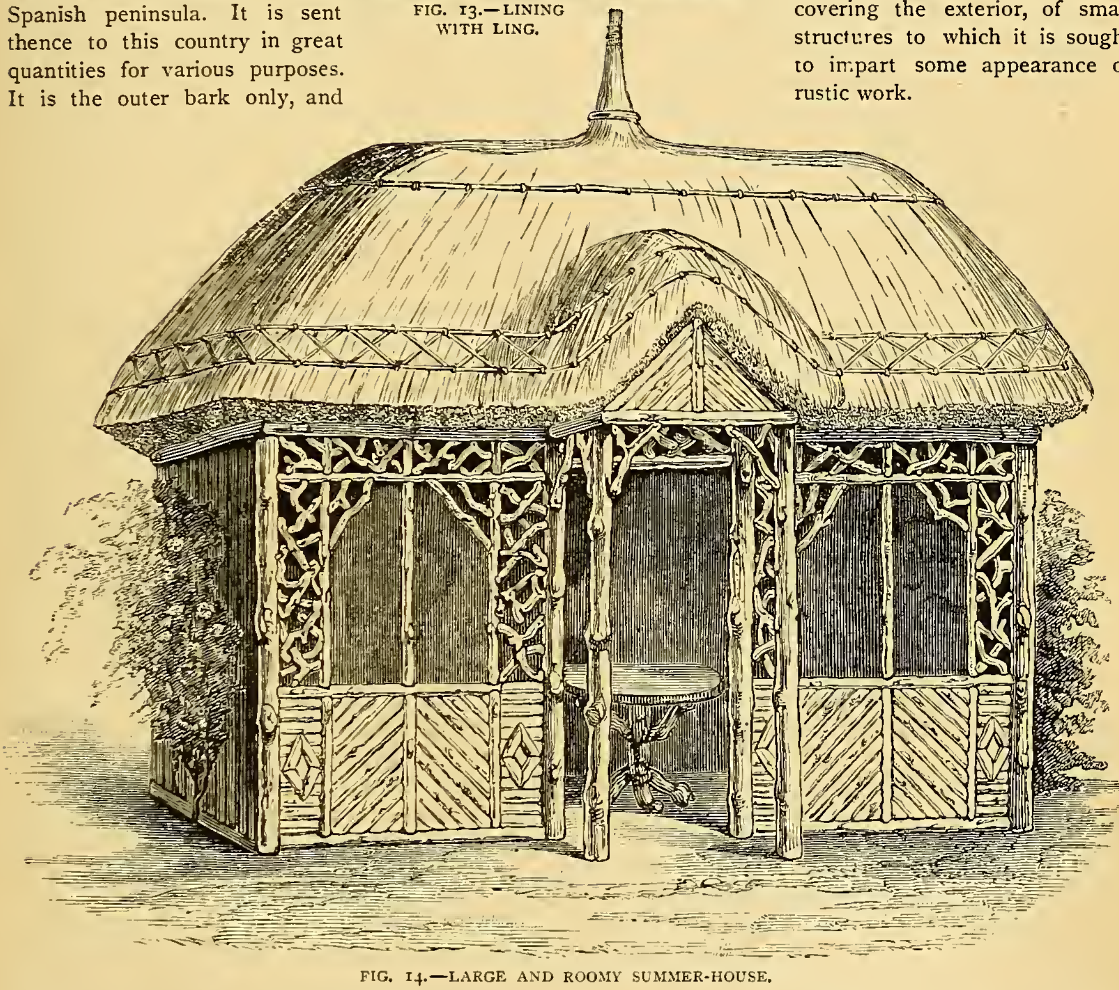


FIG. 14.—LARGE AND ROOMY SUMMER-HOUSE.

can be stripped from the living tree at intervals of six or seven years without injuring it. Virgin cork may be bought by retail at about eighteen shillings per cwt. After all, it is, however, a material better suited for

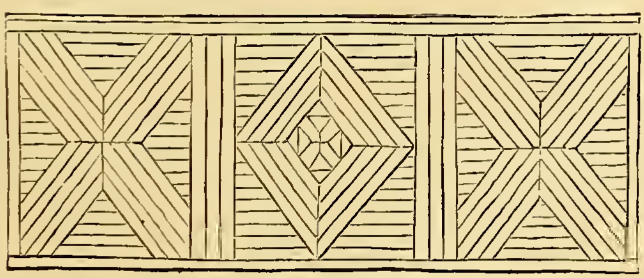


FIG. 17.—MOSAIC DECORATION OF SEAT.

With this I bring my remarks on summer-houses to an end; and in my next article I shall give designs and directions for some of the many other purposes to which rustic carpentry is applicable.

(*To be continued.*)

A FEW WORDS ABOUT PIANOS.

By W. W. C.

(*Continued from Vol. I., page* 406).

II.—EXTERNAL BUZZING—PLACING ARTICLES ON THE PIANO—REPINNING—REMOVAL OF INTERNAL PARTS—RESTRINGING.

THE appreciation which was expressed with regard to my former paper has induced me to make a few more remarks in the same direction. The subject is a very fertile one, and I trust that the following hints will prove equally useful.

In the previous paper I noticed, among other defects remediable more or less by the amateur, some that were characterized by a sound known as a buzz. Considerations of space, and a desire to make the paper more widely useful, led me to confine my attention to those sources of annoyance in this particular which are to be found in the instrument itself. I propose now to speak of a few causes that are *external* to the piano.

The principle which we found to lie at the root of internal buzzing, if we may so term it, was that of irregularity of vibration ; and this is exemplified by the external causes of the noise. In the former case, the irregularity was for the most part produced by a part of the source of the noise being fixed, and part free to vibrate independently, but not unrestrictedly. The vibrations were checked and rendered irregular by the vibrating part touching some other part of the instrument, ordinarily not in contact with it, but so close as to be within the limits of vibration. Now, whenever an article in this condition is in a room containing a musical instrument in action, there will be a buzz, more or less appreciable according to the nature of the instrument, the volume of sound, and the article in which the buzz is produced.

The first thing to be done is to determine the *locus in quo.* By standing or stooping in different parts of the room, the site of the buzz will discover itself. When this is found, the remedy is easy, quickly applied, and invariably efficacious. We shall take a few cases.

Suppose the noise is found to exist only in the immediate neighbourhood of the piano, and that after removing any adjacent articles of furniture or ornaments, it still continues. On stooping down we find it increases ; the cause is probably in the flooring. We shift the piano a little to the right or left ; the noise has ceased. The cause is undoubtedly in the flooring. One of the boards the piano rests on is loose. Which? We replace the piano and raise one end clear of the floor. On a chord, or the note generally accompanied by the buzz, being struck, nothing unmusical is heard. Then the fault must be in the board under the raised end, and this is ascertained when on dropping that end and raising the other, the voice of our old familiar friend is again heard on touching the note. The only thing required to be done is to raise the carpet and fasten down the board, preferably by screws, to the joist. If the nails which proved unserviceable can be removed, so much the better, otherwise, hammer them well down with a punch. The occasion may be taken to see whether there is any space between the flooring and the skirting board, and if there is, to insert wedges to fill it up.

Another frequent source of buzzing is the glass in picture frames, or in mirrors, or in cabinet doors, or even in a window. The glass, if not firmly fixed, will very likely rattle vigorously in response to certain notes, and cause much unpleasantness. A few brads or a little putty will at once remedy the defect in these cases. Glass proves troublesome sometimes in the form of gasalier globes. If a globe is cracked, it is certain to buzz, and it should be replaced by a new one; and even a sound one may give its inharmonious accompaniment if not firmly screwed down to its gallery. Glass appears again in candle-guards, which are frequently placed on the sconces affixed to the front, or on candlesticks stood on the fall. In such case, the glass should not rest on the metal, but should be separated from it by a little piece of cloth, or even calico, of whatever colour is most suitable.

Another fertile source is "crockery." Of late years, fancy china-ware has been greatly in vogue, and with much reason ; but, unfortunately, much that is very pretty is sold without having its base ground flat, and, consequently, if placed on a level surface, will rattle in sympathy with certain sounds. A cup in its saucer may thus prove very troublesome, or a vase on a mantelshelf. The annoyance in this or any similar case will cease if the article be stood upon cloth, or have its base ground true.

I shall mention only one more cause—the coal vase or scuttle, and the fender and fire-irons. If the vase is of metal, and the lid should be twisted slightly (which is not seldom the case as ordinary servants treat things) so that one corner touches and the other just misses the body, a rattle is very likely to result, and we shall have the same sound if the scoop does not fit tightly in its holder. Moreover, if the carpet, with a view to "turning round," is left *full* under the fender, there may be enough "spring" in it to emphasize any sympathetic vibrations that may be induced in the fire-irons. The carpet must lie perfectly flat.

It would be easy to extend this section ; but with the leading cases here given, and the foregoing state-

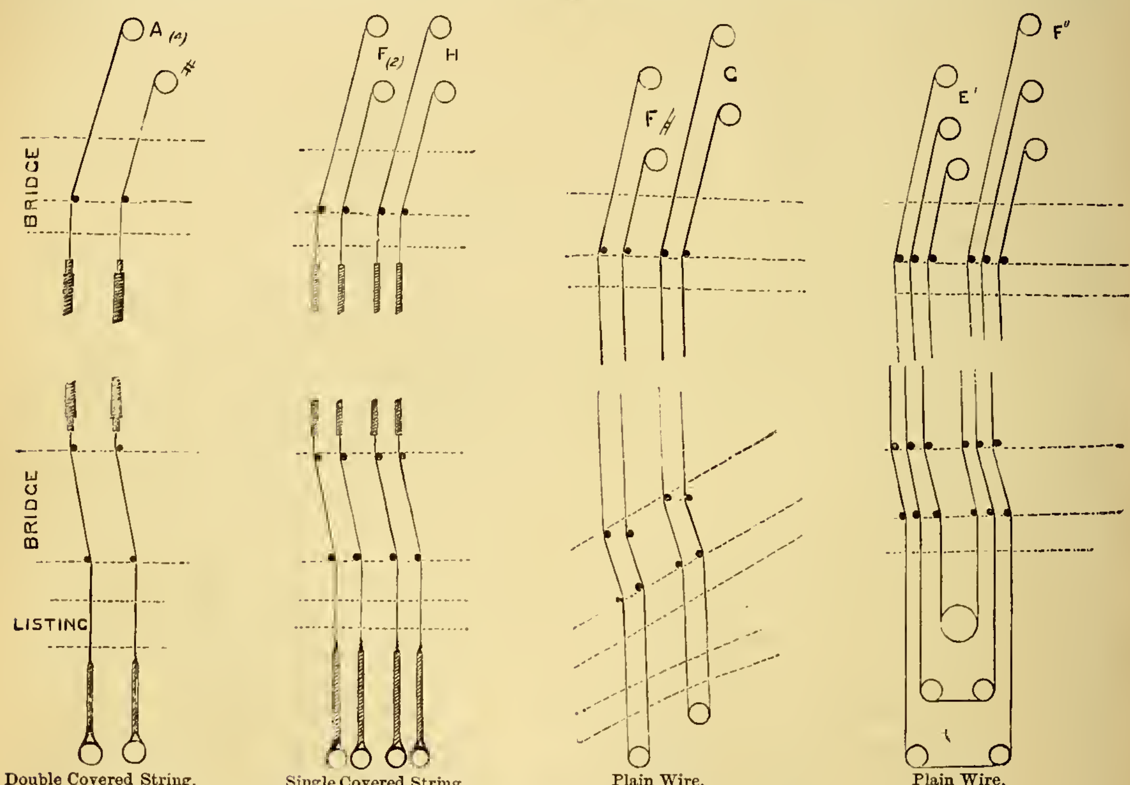
ment of the principle which operates in each, it will not, I think, be difficult for anyone to apply the principle in other cases which may arise.

II. The mention of candlesticks induces me to say a word on the subject of placing objects on the pianoforte. With many people, highly respectable, and in other respects very sensible, the lid of the piano seems to be regarded as the sacred spot in the drawing-room, whereon—sometimes in a glass case—the household god, in the shape of the most valued ornament, is enshrined; and I have seen in this post of honour, in houses of widely separated classes, the ornament from a wedding-cake surrounded by the bride's wreath, photographs in metal and glass frames, vases, "a fine specimen of native workmanship sent home by my son in India," and other things standing immediately on the wood of the instrument, which had had an extra touch of furniture polish so as to give a good reflection. The one result of a proper reflection would be the removal of the object. But this seldom happens, for although there is no absolute objection to the piano being, *when not in use*, a resting place for anything, yet we are met with this practical difficulty, that people who select such a spot for the exhibition of their idol, have a great disinclination to remove it, even temporarily, from its pedestal; and if they are persuaded to remove it for a short time, their equanimity is disturbed. Putting it generally, it is not good taste to put anything on the piano by way of decorating the room, and it is the height of slovenliness to make the lid a repository for sheet music, etc. But when the instrument is in use, nothing whatever, except candlesticks, should be allowed on it, out of consideration for the tone; for in proportion as the piano is laden, so the tone is deadened. The only admissible exception is a pair of candlesticks, but these should not rest directly on the wood, and their weight should not be more than sufficient to give them firmness during *forte* passages. The best shape is that in which the base is large, and the centre of gravity lies low. The ornamental brass candlesticks, short, and with square flat bottoms, are good; while tall lamps with light feet, and the oil-well lying high up, are about the most unsuitable. If the bottom of the stand bearing the light is flat, a piece of dark-coloured cloth should be glued to it, and if trimmed to the exact size, will not show. Otherwise, a mat should be used, and of these, perhaps, at once the neatest and most useful are the little leather mats lined with cloth or baize, and having a small design in gold, such as the Greek key, or a scroll round the edge. These act as insulators as indicated above, under "crockery."

III. Another noise! It will be said that I must like these noises, I treat so of them. Truly, they are interesting, as indicative of something amiss somewhere, and they stand in much the same relation to the piano as wheezing or coughing does to asthma or bronchitis; and as it is distressing to listen to a consumptive's cough, so is it to a musical ear to have forced on it a buzz, or this that I now proceed to consider. It is not easy to describe, but once heard, it is always recognizable. It has a *soupçon* of the buzz about it, but with that, something also of the ping one hears when a rifle bullet strikes an iron target. The cause is again irregularity of vibrations, but in this case, it is attributable to a defect in the wire, which is lack of homogeneity. Naturally, the cause may be at once localized, as the noise will be greatest when the defective wire is struck. The remedy is a new string. Restringing may be rendered necessary by other occurrences, such as enlargement of the wrest-pin holes by improper or unskilful tuning, or with age, so that the pins are not held in the original grip, or a wire break in playing or in tuning, perhaps because it has been eaten through with rust.

If the piano keeps in tune a reasonable length of time, regard being had to the amount of practice on it, a change of pins may not be necessary to meet a very slight loss of grip, but they must be replaced if the loss is comparatively great. To put in fresh pins all the movable parts of the piano have to be taken out, and as it may often be necessary to remove some part or other, I describe these movements. First, the *action*. By this is meant the apparatus which sets in motion and includes the hammers. Raise the lid, take out the front by undoing the little buttons, one at each end of the top, drawing it outwards at the top, and then lifting it from the pins in the upper edge of the fall. Next remove the fall as previously described. The action is now fully revealed. Before removing it see whether the dampers are separate. In some cases they are, in others they are part and parcel of the action. Between the stickers (*i.e.*, the upright rods which set the hammers in motion) a wire will be seen passing up to the dampers. If this wire passes through the head of the damper, being secured at the other side by a nut, and the dampers have not an independent frame working in its own sockets, which will be at once seen by working the right hand pedal, they cannot be taken out separately. Those that have such a frame will work in a socket at each end, or a socket at one (the left) end, and a eyelet hole on a screw at the other. Turn the buttons and lift up, or turn the one button, raise that end and draw out of the eye. After removing the dampers turn to the action. Fixed to the inside of each end, and six or eight inches from the top, is a block carrying a button, which keeps in position the upright bars forming the ends of the action frame. Turn these buttons, draw

the upper part of the frame outwards and then lift upwards and outwards bodily. The action is a delicate part, and at the same time heavy, and to remove it without an accident requires firmness and carefulness to exercise equal strength at each end. The slip lying across the keys will be removed by unscrewing at each end, and the keys can then be raised. The keys are all numbered, and it will save much time in replacing if they are put aside in an orderly way. To substitute new or replace the old pins, the piano should be laid on its back, and this may as well note of an octave in the most-used section of the instrument. Thoroughly dust the sides of the holes with dry finely powered chalk, replace the pin and hammer it well in to the proper extent, *i.e.*, up to the head or blackened portion. The great points in repinning are to drive the pin in perfectly perpendicularly to the head-piece, and to drive it well home. The little hole in the pin should be perpendicular to the base line of the piano. As it is of paramount importance that the pin should fit very tightly, it will require the exhibition of not a little well-directed strength to



Double Covered String, Monochord. Single Covered String, Bichord. Plain Wire, Bichord. Plain Wire, Trichord.

DIAGRAM SHOWING THE DIFFERENT MODES OF FIXING THE STRINGS IN A PIANOFORTE.

now be done. The pins are slightly roughed on the part which lies in the head-piece and as this roughness is screw-like there will be but little difficulty in extracting them. To remove a pin, first turn it sufficiently to relax the string. This can most conveniently be done with a tuning key, but a strong pair of ordinary pincers may be made to do. When turned enough, remove the string and then extract the pin with the pincers, turning to the left and drawing out.

It is possible the old pins will do with a little help. I mention this in case it is not easy to obtain new and larger ones, and only a *very little* help is needed to give a hold. Take out one of those belonging to each do this properly, but there is nothing really difficult in it. I have suggested the removal of *one* pin to a note. This will be quite sufficient in the case of a trichord or semi-trichord piano, but care must be taken to remove corresponding pins in adjacent notes by which I mean the pins bearing the ends of one string. Thus in the accompanying diagram, which sufficiently shows the system of stringing, the pins marked (*) represent those to be removed. In a bichord both pins must be removed, as the one string furnishes the two chords. If the chalk answers its purpose, the string kept by the pins thus treated will remain in tune while the other strings are affected. The difference will

first become sensible by a vibration being audible on the one note, and the remedy will be proved by the difference in pitch on damping of the wires in succession, and striking the note if the difference between the number of vibrations of each string is sufficient to be separately appreciable.

Prices of Pins.—There are six sizes of pins made. A complete set of the size ordinarily used, which is known as 0 2 A, costs 1s. 8d. The largest size (0000 A) is 2s. 6d. a set. For a smaller number than a set, 4d. a dozen is charged. These prices are those of W. Hughes, 37, *Drury Lane, W.C.*

Restringing.—The pins being fixed, we have to put in the wires. Of these there are three kinds: double covered, single covered, and plain; the first-named being for the lowest bass notes. All the covered ones are fixed singly; each chord is a separate string. The plain ones are fixed one to a note in a bichord, or the bichord portion, and three to two notes in a trichord. The course of the strings in each case is shown in the diagram. Care must be taken that the wires properly traverse the bridges, and are caught by the proper pins, which are intended to shut off the part not intended to vibrate from the free part on which the hammers act. The wire is then drawn through the little holes in the wrest pins as taut as possible (a sufficient length in the case of the plain wire being cut off the roll), and given a turn to secure it from slipping. It is then tightened up with the key and finally tuned. It will have been noticed that below and above the bridges are pieces of braid, flannel, or listing running in and out of the wires. These are very necessary, and serve to deaden the part of the wires beyond the bridges. Just below the line of wrest-pins will be, or ought to be, seen figures. These indicate the size of the wire used, and for all the notes between any two of these numbers, the size indicated by the lower is the one to be employed.

Prices.—The wire, when taken in bulk, is sold by the pound, for which weight the price is 2s. 6d. for either the plain steel or the covered wire. The latter kind is also sold by the single string, from 4d. for the thinnest to 1s. for the double covered.

The foregoing instructions will, I trust, enable many to replace a broken or defective string, or remedy mischief effected by an unskilful tuner in the way of enlarging the pin-holes or bending the pins—mischief which has been specially brought to my notice as met with in country places.

In a future paper I hope to say a word or two on removing, and preventing the formation of, rust in piano strings; and also to give instructions for the conversion of the ordinary soft pedal shifting action into the modern and more delicate *celeste.*

(*To be continued.*)

RUBBER STAMP MAKING.

By a Member of the Firm of HENRY J. MARTIN & Co., Cork.

II.—VULCANIZATION OF THE RUBBER.

THE plaster cast being now quite dry, our amateur stamp-maker may at once proceed with his work. If the stamp in hand be a very particular one, or if a large number are required—all to be cast from the plaster and of one pattern,—it is usual at this stage to soak the cast for a few minutes in a weak solution of ordinary gum-shellac and methylated spirit—a pennyworth of each will be sufficient. This mixture fills up all the pores of the plaster, and leaves on it a polished and very smooth surface, besides making that fragile material almost as hard as a stone. But for ordinary work this process is quite unnecessary; in fact, it is rarely, if ever, employed unless in the manufacture of very expensive stamps, such as daters, etc., which are expected to last for half a lifetime.

FIG. 3.—PLATE.

In either case the cast is now taken, replaced on the frame, which, in its turn, is fastened to its plate, Fig. 2. Take two pieces of the specially prepared india-rubber, which we supply in suitable sheets, cut them to the size of the stamp you require, and place them, one on top of the other, on the cast, rubbing the side next the plaster, and the back of the upper piece, with a little French chalk; but be extremely careful that none gets in *between* the pieces. Over the top-piece put a piece of paper, about the size of the rubber or a little larger. Over all place the plate, Fig 3, with the pins turned downward, and square with the edges of the frame, Fig. 2. Place this "pile" in the press, Fig. 4, carefully, keeping the edges square, and the centre of the pile directly beneath the screws, which you may tighten a little, to keep its component parts from moving about.

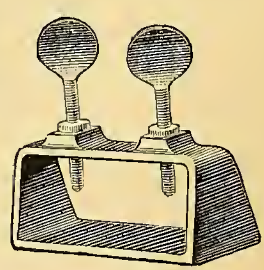


FIG. 4.—PRESS.

The vulcanization of the rubber, as it is called, may now be proceeded with. It is just as well to understand the "why" and "wherefore" of this process, as it may be truly said that more time and money

have been wasted in this part of the manufacture, than in any previous part of the process. It consists, then, in applying heat to the india-rubber under pressure, in such a degree as to expel the sulphureous gas which permeates it, and no more. This has the effect, firstly, of turning the colour of the caoutchouc to that slaty tint with which we are all so familiar; secondly, of rendering it beautifully elastic and pliable; and thirdly, to permanently retain the impression which has been imparted to it. The success of the operation depends in a small measure on the skill of the operator, and nearly altogether on the india-rubber employed. It is a mistake to endeavour to procure it at an ordinary rubber dealer's; they are ignorant of the use for which it is required, and thus may supply the purchaser with a wrong kind; or if they do happen to have it in stock, it will be very probably in the form of large rough blocks, utterly unsuited for the purpose.

Place the whole apparatus—press, frame, plates, and rubber, over a clear fire, or a gas burner; whichever be most convenient. My firm employs a Bunsen burner, size 2, which, in practice, will be found to be the best in the long run; the absence of soot and smoke being a very important item in a day's work. In this case the apparatus must be placed on an iron tripod, which may be bought at most druggists for 6d. or 8d.

In either case, do not touch the press until the heat has thoroughly penetrated every part of it, which will take two or three minutes; then, taking an old piece of cloth between the fingers, gradually, carefully, and *evenly* screw down the press, at short intervals, until the four pins on Fig. 3 penetrate right through the layers of india-rubber, and at last rest on the upper edge of the frame, Fig. 2. The press is now quite tight, and the screws can no longer be used; and now the operator can examine the rubber, a thin edge of which will be exposed between the plates As soon—generally in about fifteen minutes—as the rubber turns to a blue colour, it is a sign that the vulcanization is complete; and the whole apparatus must now be removed from the source of heat, and, with the parts still together, left to cool; or, if expedition is necessary, it may be placed in cold water. When it is quite cold, unscrew the press, take out the frame, with the rubber still adhering to the plaster in it, and carefully separate the rubber from the cast; they may stick together slightly, but it is only a chance. When separated, you will find that you have produced an absolutely faultless fac-simile in vulcanized caoutchouc of the original leaden type you used; in other words, you have made a RUBBER STAMP.

The only thing that now remains to be done is the mounting of the rubber on the brass, fixing the same in a handle, and placing the same in a box, with the pad and ink necessary for its manipulation.

The piece of brass is taken, and, by means of the square shank turned on it, forced into the hole in the handle; the rubber is then, after the edges have been trimmed with a pair of scissors, cemented on the brass with a thick solution of methylated spirit and gum shellac; it will be dry in one or two hours.

In the case of an oval or round stamp being required, an oval is bought of the size chosen, at a dealer in printer's materials, and being type high, and the centre and edge being left blank, or "pierced for type," the letters are put into it and wedged in their places by little pellets of tissue paper, small leaden spaces, or anything handy.

In practical business, half-a-dozen or more stamps are made at one operation, the wording of each being arranged as required, and the types put into the chase alongside of one another, so that name stamps, ovals, square stamps, and round will be next-door neighbours. A plaster cast is then taken in the usual manner, as if only one stamp were being made, and a similar cast in india-rubber; the various stamps are then cut and separated from one another with a pair of scissors.

Should the amateur experience any difficulty in procuring boxes, etc., my firm will supply them at the following rates, provided that not less than half-a-dozen are bought at one time:—

Cloth-covered Boxes, with drop-pad and lid, 3s., 3s. 6d., and 4s. per dozen, according to size; the smallest is suitable for name stamps, the largest for a large oval.

Endorsing Inks, any colour, with patent stopper, 3s. per dozen, up to 1-oz. bottles, 5s. 6d. Indelible Marking Ink, 4s. per dozen.

Brass Mounts, any size not exceeding 2 inches in length or diameter, 4s. per dozen, up to 2½ inches, 5s. Black polished handles, with brass ferules, bored, 2s. per dozen.

Monograms have to be specially designed and engraved on wood, from which a plaster cast is made. As this is beyond the average amateur, my firm have made arrangements to supply the rubber of any two-letter monogram for 8d., post free.

Fac-simile Signature Stamps have to be prepared in the same way as monograms. The prices vary according to the intricacy of the signature.

My firm will, with pleasure, supply the amateur with a single sample box, ink, mount, and handle, for 1s. 2d., post free.

I think that I have now finished my task, and have described "RUBBER STAMP MAKING" as plainly as I could. My chief aim has been simplicity, and I trust I have left nothing unsaid that I ought to have

explained. If I have erred in this way, a letter to my firm will have every attention, and the answer will duly appear in "our" pages.

Those who have purchased our outfit—and they are many—will confer a great favour on me by kindly sending their experience of it to the Editor, for the benefit of other readers.

MOVING MODELS FOR BAZAARS, Etc.

By DONALD BEDE.

I.—A MODEL WINDMILL.

"DROP a penny into the box and the model will work." My readers will doubtless call to mind, as they read the above, many specimens of automata bearing the above legend, which have excited their curiosity and admiration, if only from the powers of mechanical contrivance displayed in their construction; and while recalling their apparent complication will be inclined to consider them quite beyond the constructive ability of the ordinary amateur. Doubtless, to construct the entire mechanism, or train of clock-work wheels, which form the motive power of these models, would very severely tax the abilities of most handy amateurs, but this is by no means necessary, as the ordinary movement of a clock can by a little ingenuity, and the exercise of a little patient labour, be adapted to the purpose in view—requirements which will be quite easy to any "handy man," who can do a little soldering—and will enable any one desirous of contributing an attractive and remunerative addition to a bazaar, or other suitable place for charitable or benevolent purposes. I propose giving instructions for making moving models of a windmill, a yacht in full sail, a water-mill with real water, a self-acting perfume fountain, and a reproduction of my Early Riser's Friend, which I exhibited at St. Pancras Industrial Exhibition—all of these to be set in motion by a coin being placed in the receptacle.

We will now set about making up the mechanism of one of the easier and most simple of all, "the moving windmill," which, when finished, will bear the legend at the head of this paper, and go merrily round, as the "wind is raised" by dropping a penny in the box. I may mention, that will cost about 8s. We shall require a box about 18 inches high by 12 inches long by 10 inches deep (Fig. 1), with a horizontal partition 6 inches from the bottom, with a cash drawer at the right hand end. This box is closed in on all sides except the front top part, which is of glass—this is done so that the effect is seen only from the front—an arrangement which the exhibitor will find absolutely necessary, as it is no uncommon thing for a group of people to wait a considerable time within seeing distance for *some other people* to drop a penny in. If the sides were all glass it would tend to diminish the receipts considerably, so that we must conduct our show on Artemus Ward's principles, viz., "You can pay without going in, but you can't go in without paying."

At the back of the case we can stick a suitable picture, a landscape, on a rising ground, etc. This can be probably cut from some illustrated periodical, the outline of a windmill is so familiar that it is scarcely worth while taking up valuable space in describing it—in fact, one could be purchased at a toy shop ready made, and a hollow card-board copy made from it; assuming this matter to be settled and that the axle of the wheel or sail is about $\frac{1}{8}$ of an inch thick, we will go on to preparing the mechanism. A train of wheels suitable for the simple purpose of moving the sails of our windmill by means of a spring is what we want, and this will cost less in the form of an "eight-day time-piece movement," than it would to have a less number of wheels cut. This movement can be obtained at Messrs. Mayer and Son, 27, *Aldersgate Street, E.C.*, and will cost 5s. 6d. It will consist of the works, hands, and pendulum of the clock—the two latter of which we shall not want.

If we examine this movement, we shall see that, by turning the long hand round, the other parts of the mechanism do not move with it; and by looking along the spindle of the central wheel, we shall see where a part of it remains at rest. We must now solder these two parts together, which we can do without removing any part of the clock-work. Just file a large spot bright, and with a copper bit, or a blow-pipe, "sweat on" a little solder; this will make the whole rigid, but will "do" for the clock as a time-keeper. The escapement, which is at the top right-hand corner of the movement, is of no use to us, so turn the spring on one side which holds it in its place, and remove it; the clock-work, being now wound up, would run down rapidly, having no check.

We shall now want a pulley-wheel, B—a wooden one, such as is used by Venetian blind makers will do—about $1\frac{1}{2}$ inch in diameter. This must have a nick about $\frac{1}{4}$ inch deep, made in any part of the rim, and be fixed on the spindle of what was the position of the minute-hand. This size wheel will leave us room to get at the winding-up wheel. We will now mount the movement on a projecting piece in the box, so that the above pulley-wheel is under the model. All we have to do to set it in motion, is to tie a piece of thin string over the pulley-wheel and over the axle of the model, wind up the clock, and off it will go. The speed may be regulated by placing the sails of the

mill at such an angle that they offer more or less resistance to the air.

We now want our mechanism for stopping and starting, A, which is made of wire and two pieces of tin. Bend up a piece of tin in the form of a scoop, and solder to one end of the wire, and place an upright piece of tin at the other; a cross-piece, bent into a small tube shape, and hanging upon another piece of wire fastened to the box, will allow this lever to hang as on a pivot. The scoop end should be much longer than the other end which drops into the nick of the pulley. This end must be weighted, so as to be a little heavier than the scoop end. The clock being wound up, and a penny being dropped through the slit falls on the scoop, which tips up, lifting the other end out of the nick, and allowing the works to move, which continue in motion until the "nick" has travelled round to its former position, when the upright piece of tin, dropping in, stops the works. The pulley being twelve times larger than the axle of the model, the sails will revolve twelve times each time it is started. The model will work 192 times without attention, and net 16s. in so doing.

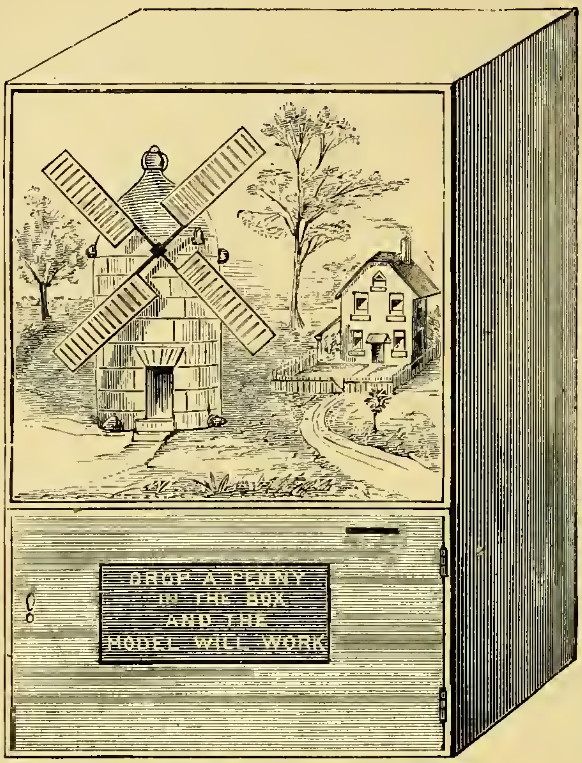
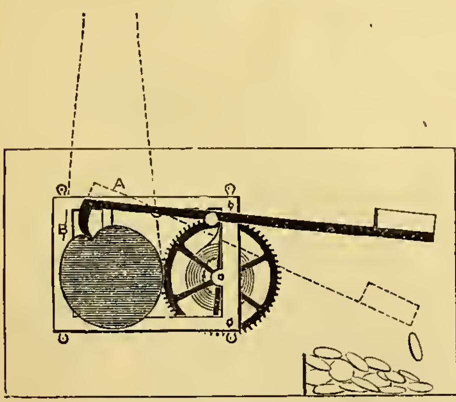


FIG. 1.—MODEL AND CASE COMPLETE.



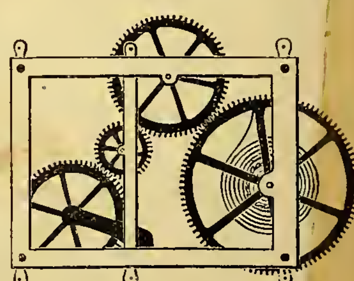


FIG. 2.—SHOWING TOP OF CLOCK MOVEMENT WHEN PARTS NOT REQUIRED HAVE BEEN REMOVED.

FIG. 3.—SHOWING INTERIOR OF BOTTOM OF CASE. THE DOTTED LINE SHOWING THE ACTION OF THE LEVER WHEN THE COINS ARE DROPPED IN ; ALSO CORD LEADING TO AXLE OF WINDMILL FROM THE WOODEN PULLEY.

Of course models embodying other subjects require some variation in the application of the mechanism, but the principle is the same in all ; and this has been explained, I hope clearly, and in such a way that all my readers can understand it, in the foregoing brief description of the plan that must be followed in making a model windmill. I may also add that there are other ways of utilising these working models than as a means for collecting pence at bazaars. For example, savings' banks for children might be made on this principle, for as a very large class of persons are more readily eased of money for charitable purposes when they can get a little amusement of one kind or another in exchange for their money, it is reasonable to suppose that children in like manner would be more willing to part with their pence for a time to accumulate as savings, if they could have the satisfaction of seeing the model work whenever they put by a penny. I offer this as a suggestion, and if it is adopted and works well in one family only, I shall have done something towards the encouragement of personal thrift.

(*To be continued.*)

PT

PRESENTED WITH PART XX. OF
AMATEUR WORK, ILLUSTRATED.

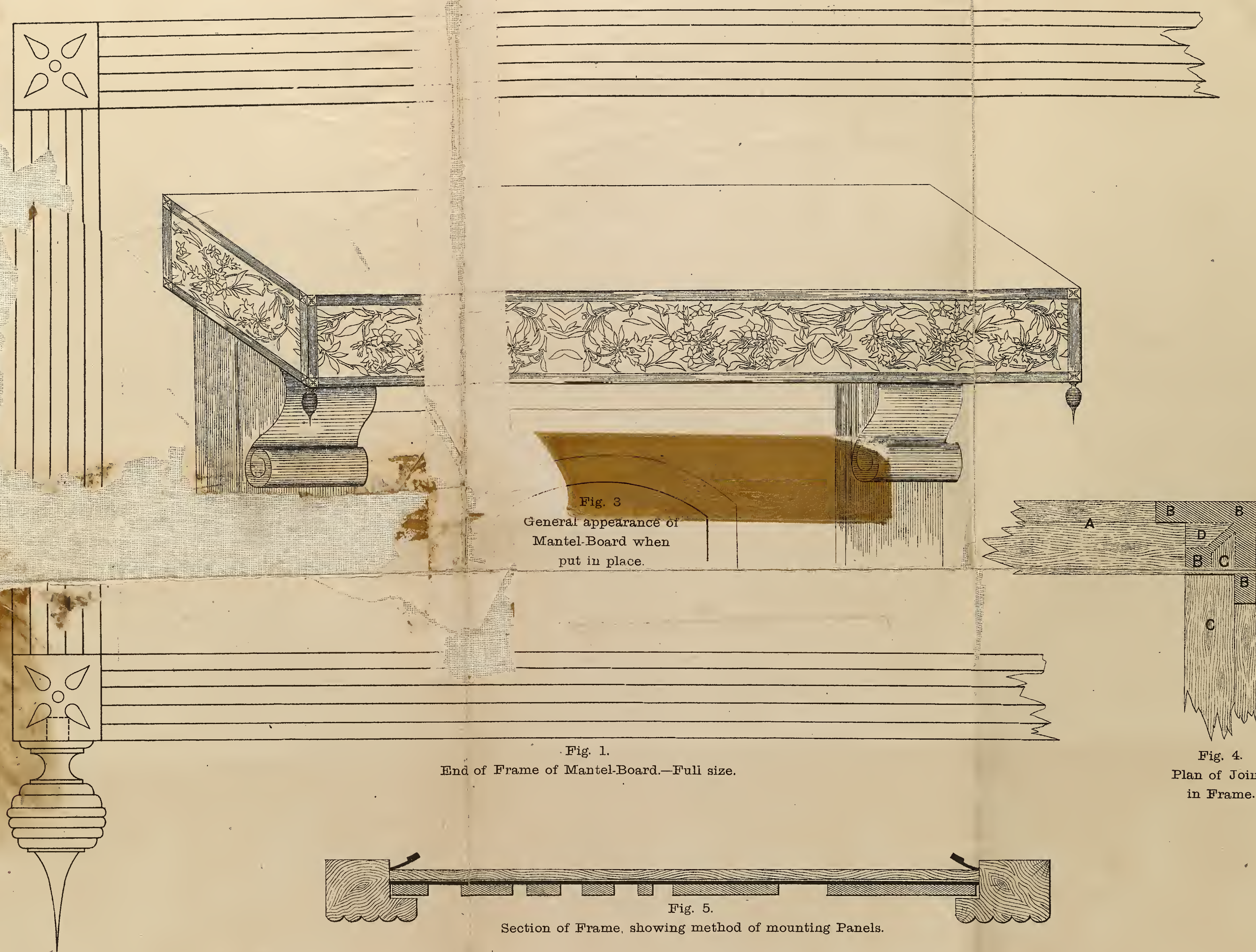


Fig. 3
General appearance of
Mantel-Board when
put in place.

Fig. 1.
End of Frame of Mantel-Board.—Full size.

Fig. 4.
Plan of Joint
in Frame.

Fig. 5.
Section of Frame, showing method of mounting Panels.

Fig. 2.
Design for Front and Sides of Mantel-Board.

WARD, LOCK, & CO., WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

THE "AZALEA" MANTEL-BOARD, IN FRETWORK. BY WM. A. FOX.

THE "AZALEA" MANTEL-BOARD.

A STUDY IN FRETWORK.

By W. A FOX.

(*For Illustrations, see Supplement to this Part.*)

AS one of the readers of AMATEUR WORK, who is making the "Lily Mirror," the design for which appeared in the number for September, 1882, it occurred to me that fretwork would be of great assistance in replacing the fringe or needlework border usually found beneath an overmantel.

Having succeeded to my own satisfaction in making a mantel-board, with fretwork panels, in place of the fringe, I venture to lay my designs before my fellow-readers, in the hope that they may prove useful to more than the writer of these lines.

The result of carrying out the designs given, would be a piece of furniture 5 feet 10½ inches long, 15 inches wide, and 8½ inches deep. The size can, however, be easily made to suit one's requirements, by taking from, or adding to the panels, and making the frame to correspond.

To make one according to the above measurements would require 9 feet of ½ inch oak, a little over 7 inches wide, 20 feet of good deal about 1 inch square, 9 feet by 7 inches of thin deal board such as is used by picture-frame makers, for backing their frames, and a piece of deal, 5 feet 9 inches long, 14¼ inches wide, and 1 inch in thickness.

Having obtained my wood through the assistance of a neighbouring timber merchant, and Messrs. Churchill and Co., of 21, *Cross St., Finsbury, E.C.*, I commenced by making the deal frame, which, to facilitate description, may be considered to be made up of three picture frames, a long and two short ones, put together at right angles to one another. These I shall speak of as the "front frame," and the "side frame." When purchasing my deal battens, I had them sawn into the required lengths, viz., two pieces about 5 feet 10 inches, four about 15 inches, and four 8½ inches long. Having planed these into respectability, I proceeded with a marking-gauge to produce the four grooves required to give the fluted appearance on the front of the frame; having made these grooves fairly deep, and at equal distances, with a piece of sandpaper, I rounded and finished them off. To one who is fortunate enough to possess one of the planes made for the purpose, this part of the work would be much easier; but I cannot say that I found it a very onerous task, with even the simple means at my command.

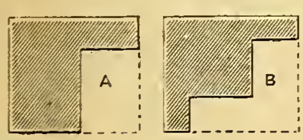


FIG. 1.—MODE OF RABBETING FRAME.

Next I turned my attention to the rabbets, into which the panels are to fit. With a rabbeting plane, I worked the two long pieces, and four 15 inch pieces on one side only, as in Fig. 1, A; but the four 8½ inch ones on two sides, as in Fig. 1, B. In these figures the dotted lines show the part cut away. Here, again, a cutting-gauge and chisel will come to the aid of the aspiring one, with a not too elaborate tool chest. I then cut the mortises in both ends of the 8½ inch pieces, and the tenons on the ends of the remaining pieces.

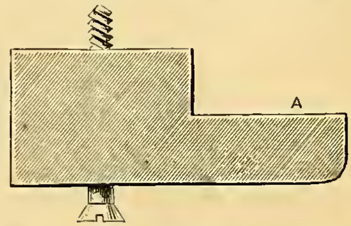


FIG. 2.—MODE OF SECURING BOARDS TO MANTELPIECE.

The joints into which all three pieces enter, will perhaps require some explanation, and this I have endeavoured to give in the diagram, Fig. 4 (*Sup.*), where A represents the 5 foot piece, C the 15 inch, and B the 8½ inch upright one. At each end of A and C the tenons, *c* and *a*, are cut, and then on the two adjacent sides at each end of the upright B, I cut the mortise represented by dotted lines, into which *a* and *c* should fit firmly. The remaining joints at the sides of the frames consist of the simple putting together of two pieces of wood, and scarcely need any detail.

All this being done carefully, the glue-pot and a few taps of the mallet, with the try-square near at hand, to ensure right angles, and the frame is ready Then with a fine saw and sharp chisel I cut away a square inch, about ⅛ inch deep at the four corners of each of the three frames mentioned before, and replace them by a square inch of ⅛ inch imitatio ebony, in which I had cut five holes to represent the cross shown in diagram Fig. 1 (*Sup.*)

The frame was then finished by staining with Stephens' Oak Stain, to the tint of old oak, and when thoroughly dry, rubbed over with a rag dipped in boiled linseed oil, and time having been given for the oil to soak in, the necessary polish was obtained by means of a dry flannel, and a modicum of elbow grease.

Finally I fitted the frame on to the mantel-board, fixing it there with a liberal supply of glue and long headless brads, which I drove deeply in between the flutings. Of course, some stronger fastening is necessary, to say nothing of support; but as their aid was not called in until the panels were in place, I shall refer to them later.

This little joinery, though simple, may seem somewhat of an obstacle even to a practical fret-cutter,

with small taste for carpentry and joinery. To him I would suggest the services of the nearest joiner, who will supply the deal, and make it up for an outlay of from six to ten shillings. He can then commence at this stage of the work, when having my frame in order I fitted in the panels, and deal backing. After satisfying myself that they put together well, I took out the oak, and cut it up into lengths of 14 inches each, and began work with the fret-saw.

To do this well, and to minimize labour, I put four of these pieces together with small screws, pasted my paper pattern on that, uppermost, and then proceeded in the usual way.

I always find that the Rogers' Fretsaw cuts the half-inch wood, thus made up, with great ease, there is less chance of the wood breaking, and my lines are far truer and cleaner than they would be in such a large piece of thin wood as I should have to deal with if I cut my panels separately, to say nothing of the monotony of repetition. The remaining three lengths are treated similarly.

With regard to the cutting of the design, it may be as well to mention that, unlike the generality of patterns, and like those of the "Lily," the design is the part to be cut away, so that what one wants is a sort of stencil plate in oak.

The fretwork being completed, I put the panels into their places in the frame, being careful to see that I put them together in the same order in which they were in the plank, thus ensuring continuity of the grain, and exactness in fitting; behind this, I put a piece of velvet to throw out the design. Various materials may do duty here, according to the taste of the worker; polished wood of a darker colour, *e.g.*, rosewood would, doubtless, have a very good effect, and greater display may be obtained by gilding the edges of the leaves and flowers. I used velvet because the other fretwork ornaments in the room are mounted on it; this very fact may be the reason why some would prefer the novelty of a wooden background. Behind the velvet came the deal backing mentioned before, and I found it greatly assisted the evenness of the velvet, to glue its edges to the deal. This was all fixed in place as in picture framing, by small brads, and a covering of brown paper to keep out dust.

The position of things I have shown in Fig. 5 (*Sup.*), where a section through the frame is given. The interrupted, shaded line, represents the fretwork panel, next comes a dark line, which stands for velvet, and a shaded line behind this does duty for the deal backing; the usefulness of the brads being rewarded by including two of their number in the diagram.

The light colour of new oak not being to my taste, before cutting up the wood I rubbed it over on the side intended to be seen, with a rag dipped in boiled linseed oil, and having given this time to soak in, I laid on a very light coat of spirit varnish, this resulted in giving a very nice colour to the wood, and one that contrasted favourably with the old oak colour of the framework. Of course, after doing this, I had to be careful that sandpaper should not be required for the surfaces so treated, and this I did by laying the panels, when putting them together for fretcutting, with the varnished surface upwards. All were thus placed except the uppermost one in each set. These had the unvarnished back upwards, and on this I pasted my pattern.

Necessarily, this method gave me two panels on which the design was reversed, rendering them useless for the front frame, where one wants the design to be continuous. But they do very nicely for the side frames; giving a similarity of design at the corners, which I considered a somewhat acceptable variation.

The mantel-board now has a somewhat box-like appearance, which I overcame, at the suggestion of a friend who rejoices in the possession of a lathe, and who carried out his suggestion by turning four knobs, like those in Fig. 1 (*Sup.*), the pegs of which I glued into holes made to receive them under each of the upright pieces of the frame.

The board being now finished, I now applied the extra support alluded to above, in the shape of three ∟ shaped clamps, one arm of which I screwed to the under surface of the mantel-board, fastening the other arm similarly down the middle of each frame, with screws driven into their upper and lower bars. These three pieces of metal convert a delicate yielding structure into almost a rigid one, and help materially in preventing the work from getting out of shape when there is a fire in the grate.

Finally, I glued a piece of Utrecht velvet on the top of the mantel-board; and if this is done carefully along the edge, there is no fear whatever of the material fraying out by use and wear.

There are various means used to secure a board to the mantelpiece; but the one I have found most serviceable is that in which a piece of wood of this shape is screwed at each end underneath the board where it projects beyond the mantelpiece; by tightening the screw, the end A is driven firmly up against the mantelpiece, and holds it firmly against the mantel-board.

As the flower which I have chosen for treatment in my design is the azalea, I have, for distinction's sake, designated my work The "Azalea" Mantel-Board. It may appear to some to be somewhat delicate in appearance, but with average care it can be cut with success, and presents a handsome appearance when done.

A HOUSE FOR DOLLY.

By THE EDITOR.

II.—THE FITTINGS, OUTWARDLY.

OF the details and ornamentation, the windows, and other accessories of the doll's house, I must speak in the present paper, for in my first I was compelled, of necessity, to confine myself to the carcase of the structure, as builders term it, and the mode to be followed in making it. Indeed, I was unable through want of space to say as much as I intended about the carcase itself, so I will make up the deficiency here before I enter upon the next part of my subject. My readers who have followed me thus far will possibly have noticed that no reference was made to the blocks which are shown in Fig. 2 (page 335), as being attached to the bottom boards of the compartments, namely, the board or floor A B C D to the left, and the board A′ B′ C′ D′ to the right. These are useful in many ways, for they not only impart firmness and stability to the structure when attached to the bottom boards with screws, but they also serve as pieces on which may be nailed thinner pieces, so as to form a plinth to the house, and to conceal small iron castors, placed within the slips, one in each corner of the under surface of the bottom board of each main compartment. It is almost needless to remark that the compartments should fit closely and with accuracy when the house is closed, and to ensure this, the edges B L P Q C of the left hand compartment, and the edges, B′ L′ P′ Q′ C′ of the right hand compartment, should be planed up with a trying plane.

Let us now proceed to the fittings and ornamental work about the house, and in this we will endeavour to follow some regular plan, or at all events to touch on the various parts in the sequence in which it seems most desirable to handle them. To understand the *modus operandi* thoroughly, it will be as well before proceeding any further to examine Figs. 3 and 4, in which are shown the front elevation and the end elevation of the house. The form of the carcase as described in my first paper will be easily recognized in spite of the ornamentation, which, when completed, turns a bare and unmeaning looking pair of lid-less boxes set on end and linked together by hinges, into the semblance of a neat little cottage or so-called villa, sometimes to be met with in the suburbs of London and the larger country towns. The points on which our few hints are desirable, are, 1, *The Windows;* 2, *The Chimneys;* 3, *The Roof;* 4, *The Parapet to the Roof;* and 5, *The Quoins* or ornamentation at the corners of the house and running from top to bottom.

There was once a man—by the way, he must have been an amateur architect—who designed his own house and set to work to have it built. When finished, it was a pretty house to look at and replete with every convenience, but there was one omission which spoilt the whole affair—he had forgotten to provide for the staircase. I mention this because I daresay that some readers who have noted the points I selected above for special comment will think that I have forgotten the door. This, however, I have not done. I intend to treat of all openings made in the carcase for the *quasi* admission of light, but not of access to the interior, under the general term of windows, and it will be found presently that one of the windows on the ground floor is fashioned so as to do duty for a door or a window, according to its position when the house is closed and open, and to the whim or fancy of the owner, like the article of furniture described by the poet as being

> ——— "contrived a double debt to pay;
> A bed by night, a chest of drawers by day."

1. *The Windows.*—These are ten in number, there being six in front of the house and two on either side. Let us take the side windows first, as these are sham windows, and are therefore easier to deal with than the others. Let us suppose that the area of glass that is *exposed to view* in the side windows is, in the upper window, just half the height and one-fourth the width of the exterior portion of the casing representing the room that it is supposed to light. Thus, on the supposition that the height and breadth and depth of the room are equal, the four lower rooms being taken *externally* to be cubes, if these dimensions are divided into twelve parts, the area of the glass will be six parts in length or height and three parts in width. The glass must be cut a little larger than the size of the supposed window; the back part must be blackened or placed against a backing of black paper. An imitation blind part way down the upper half of the window may be added if preferred, and the glass held in position by a framing of thin wood rabbeted on the inner edge to the thickness of the glass. The method of doing this is shown in Fig. 5, in which the tinted portion A A, represents the glass, extending on all sides to the dotted line about half way under the rabbeted casing, B B B B, by which it is held in place, the casing being nailed to the box with small French wire nails, or glued down, as preferred. The window is finished by nailing or gluing down a piece of wood, triangular in section, as shown in the illustration, and having the ends bevelled off as drawn at the top of the rabbeted casing to form a kind of coping above the window, and a rectangular piece at the bottom to form the window sill. Brackets should be glued on as if to form supports for the coping and sill, as shown, in order to give a more ornamental appearance to the

window. These may be cut from a piece of moulding suitable in depth to the size of the house. A small strip of wood, C, is placed across the glass in order to give the appearance of a sash window formed of two large panes. The ends are secured by being let in under the sides of the casing, as shown in section at A in Fig. 6. The top of the window is circular in form, but it is optional whether or not the triangular openings be cut in the upper corners as shown in the drawing. The introduction tends to give a lighter appearance to the window. There is an alternative method of making the window which may be preferred by some amateurs, and that is to make a recess or hollow in the side of the box of the thickness of the glass, so that the glass may be dropped into it, its outer surface being flush with the surface of the box. The appearance in section of the glass, casing, etc., along the dotted lines which show the extent of the glass is shown at X and Y, the plan of the sill being also shown in X. This disposes of the side windows of the structure.

The next thing to be considered is the preparation of the front of each compartment for the windows in the front of the house, which must be practicable, to borrow a theatrical phrase, in so far that they will afford a view of the interior of the rooms, although they are not made to open and shut; for this would entail an amount of labour and contrivance which it would be scarcely worth while to take, and which could be better managed if the windows were

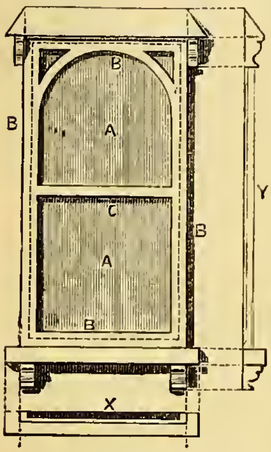


FIG. 5.—WINDOW IN SIDE ELEVATION.

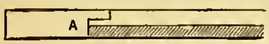


FIG. 6.—SECTION (LONGITUDINAL) OF BAR AT C IN FIG. 5.

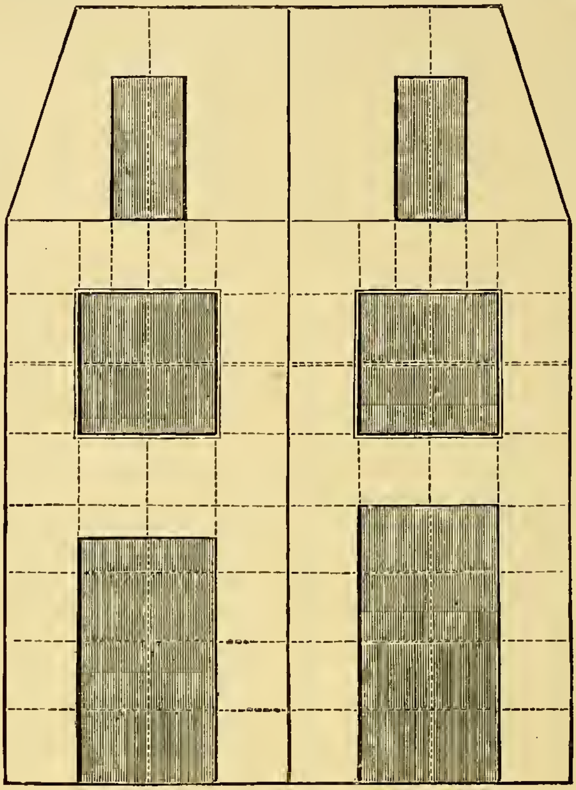


FIG. 7.—REGULATION OF OPENINGS FOR WINDOWS IN FRONT OF HOUSE.

FIG. 11.—SECTION OF PANELLING AT X Y IN FIG. 10.

FIG. 8.—PLAN OF BASE FOR THE LOWER WINDOWS OF HOUSE.

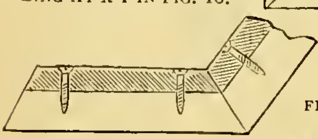


FIG. 12.—PLAN OF FRONT AND PART OF ONE SIDE OF SILL SHOWING ATTACHMENT TO CASING.

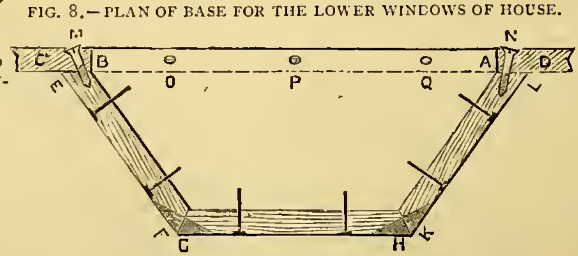


FIG. 9.—ENLARGED PLAN OF BAY WINDOW, SHOWING MODE OF FASTENING SIDES TOGETHER AND ATTACHMENT TO FRONT.

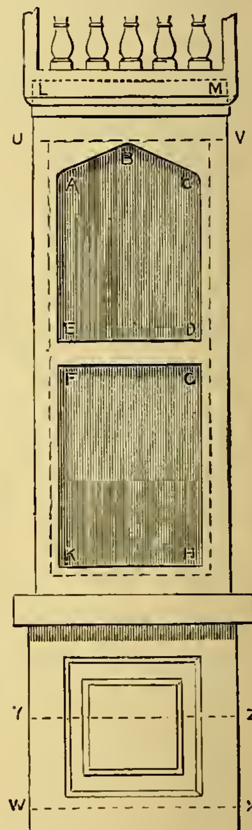


FIG. 10.—ELEVATION OF SIDE OF BAY WINDOW ON LARGER SCALE.

treated as casement windows, opening on the outside.

Apertures must, of course, be cut in the front part of the boxes that form the compartments, in order to furnish openings suitable for the windows. The front of each box might have been formed of separate pieces put together to avoid the necessity of cutting the openings ; but to cut out the pieces will be found easier, and therefore will be the better plan for the amateur to follow. Some regular plan must be hit on for forming the openings, and no better one can be adopted than that shown in Fig. 7, in which—always remembering that the external front of each of the principal rooms is a perfect square, if the redundancy of the expression may be pardoned—the front of each room is subdivided into sixteen smaller squares, as shown by the dotted vertical and horizontal lines traversing the elevation. The shaded parts of the diagram show precisely what portions are to be cut away. The cutting is easily managed by the aid of a stock-and-bit and key-hole saw. Having marked the extent of the openings, as shown by the black lines that surround each, bore a hole with the stock-and-bit at *each corner* of the parts to be taken out in the first-floor rooms, but in the upper corners only of the lower openings. These holes will render the introduction of the key-hole saw, by means of which the parts are to be cut away, a very simple and easy matter.

When this has been done, and the sides of the openings rubbed down with a little fine glass paper, applied by aid of a thin piece of wood or cork, so as to prevent any rounding of the edges, make a small rabbet round the openings cut for the first-floor windows just deep enough to receive the glass, and bring its surface flush with the exterior surface of the front of the house. This done, a framing or casing must be made for the windows, as described for the false side-windows, with this exception only, that there is no occasion to make any rabbeting round the inner edges of the main part of the casing, because the glass has been dropped into a recess formed to receive it by means of the rabbet or rebate cut round the

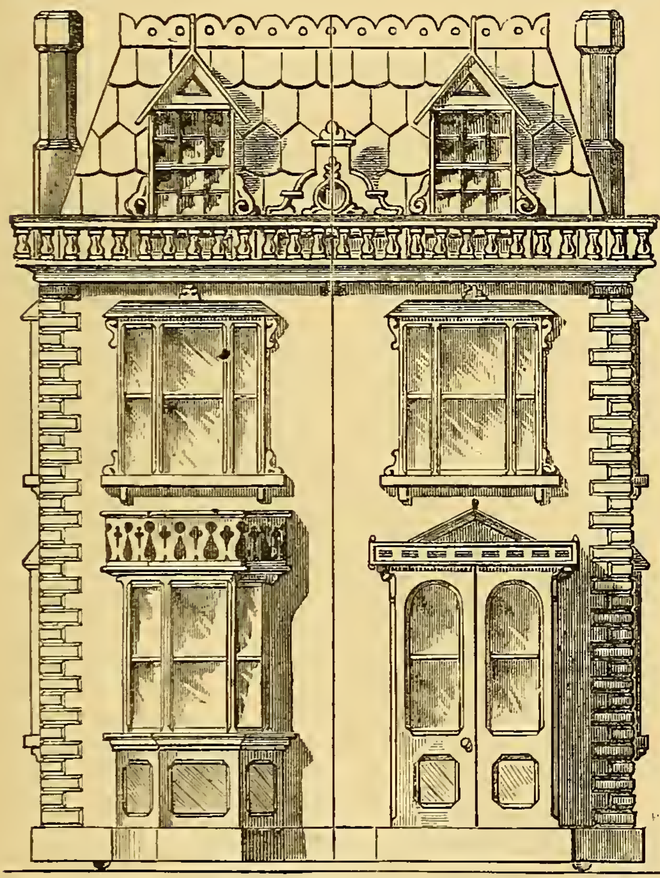


FIG. 3.—FRONT ELEVATION OF DOLL'S HOUSE.

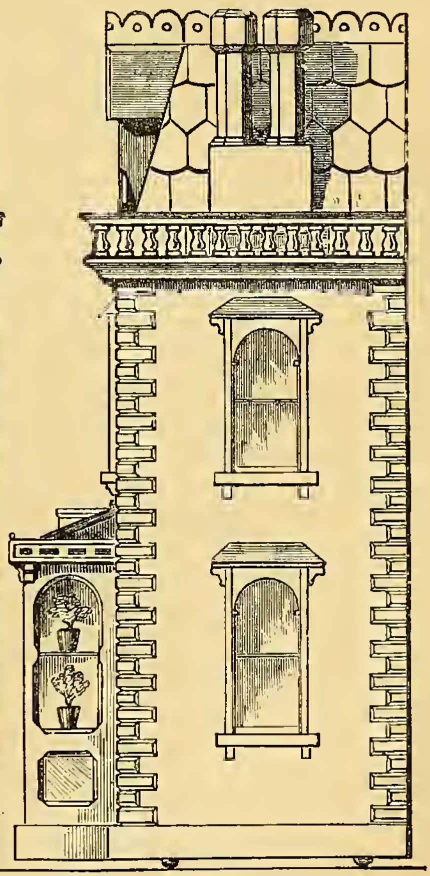


FIG. 4.—SIDE ELEVATION.

edge of the opening. This rebate may be easily formed by cutting a line with a sharp-pointed knife about $\frac{3}{16}$ inch from the edge of the opening to a depth equal to the thickness of the glass, and then removing the wood between the line thus cut and the edge of the opening with a sharp chisel. The casing round the window, the sill, the coping, and the brackets are made in precisely the same manner and of the same size as for the side-windows; and the windows themselves are divided, as it were, into six large panes by means of two vertical and one transverse slip halved into one another, and having their ends secured under the exterior casing, as shown in Fig. 6. The brackets may be turned sideways under the ends of the coping, to present a more ornamental appearance, as shown in the front elevation in Fig. 3; but in this case they must not be thicker than the casing itself, which should be $\frac{3}{16}$ or $\frac{1}{4}$ inch in thickness; and other pieces should be added at the lower parts of the sides of the casing, resting on the upper part of the sill, as shown in the drawing. These are all minor details, which may be varied at the pleasure of the maker; but it is desirable to call attention to them, and some of the methods of treating them that may be conveniently adopted and followed.

We have now only to deal with the attic windows, the bay window to the left, and that to the right, which is possessed of a dual character, inasmuch as it serves as either door or window, and it may be as well to take the lower ones first. In cutting away the lower openings, the portions of the front taken away will leave the edges of the bottom boards exposed at A B and C D, in Fig. 8. To afford a base for the bay window and French window, as we may call it for distinction's sake, blocks must be fixed to the slips that have been already screwed to the bottom boards on their under surface, of the shape indicated by A E F B, and C G H D, and the top of these blocks must be flush with the *upper surface of the slips*. The fixing may be done by aid of dowels or by means of screws passed through the slips from behind, and entering the inner edges, A B and C D of the additional pieces, drawing them closely and tightly to the edges of the slips. It is desirable to unscrew the front slips, in order to obtain greater facility for attaching these pieces, and then to screw them on again. I may as well take the opportunity of pointing out here that holes for the reception of the heads of the screws, and indeed, of all screws, should be countersunk by the "rose" bit, and that the holes for the upper part of each screw, between the head and the thread, should be made easy, for it is the pressure between the head on one side and the grip of the thread of the screw on the other, that draws and holds the pieces together. If amateurs would remember this, they would save themselves much trouble and undue waste of power in screwing up, and let them never forget to plunge the end of each screw in the grease pot before driving it in.

In the block plan shown in Fig. 8, it may be said that as the line passing through the points A, B, C, D, represents the front edge of the bottom boards of the carcase to which the vertical boards in front and at the back and sides are nailed, so the parts K L, B C, and D L, represent sections of the lower ends of the front boards, A E F B, and C G H D, the shells of the bay window and French window respectively, and the space between the middle and outer lines, the section of the moulding or plinth which is finally nailed on as a finish round the front and sides of the doll's house. The shells or casings for these lower windows must be made separately, and fixed to the carcase when completed. The *inner edge* of the opening of each shell must correspond with the edge of the aperture against which it is to be placed, so that the entire edge of the shell will butt against the front of the structure to which it is to be fixed, partly by gluing and partly by thin wire nails, or rather by nailing and gluing combined.

To make the shell for the bay window, take two pieces of wood half-inch thick, or of the same thickness as the bottom boards, whatever they may be—I say half-inch because this is a sufficient thickness for the wood used throughout the carcase, though for strength's sake it may be as well to have the bottom board and the top board a little thicker—of the same shape as A E F B, and use these at the top and bottom of the shell. The projecting rectangular side A B of the lower piece will fit into the recess between the parts of the front board that are left in position at the bottom, and the corresponding projecting piece in the upper board will enter between the sides of the opening at the top, and butt against the top of the opening to which it is to be fixed by gluing and nails, or thin screws driven in an upward direction through the top piece and into the end of the boarding above it, when completed. The formation of the bow window and the method of putting it together, and attaching it to the front of the structure, may be seen more clearly from Fig. 9. In this, A B shows the part of the bottom board (represented by A E F B, in Fig. 8), which fits tightly between the parts C and D of the front boards, and E F, G H, K L, represent the sides and front of the casing of the window, which are glued and nailed with wire nails to the pieces that form the top and bottom, as already described. To connect the sides and front still more closely, saw kerfs transversely to the edges of the joints may be made, one near the top, one near the bottom, and another about the middle, into which slips of mahogany

or hard wood may be driven, after being first glued. The skewed screws at M and N show how the shell of the windows may be attached and drawn close to the front from the inside of the house, and O, P, Q, are wire nails or screws by which tbe edge of tbe board is attached to the slip below, and in a similar way the edge of the top board to tbe edge of the opening for tbe window at top. The edges of the three pieces of wood that form the front must be accurately bevelled as shown in the illustration, so as to fit closely together and against the front of the house. The mode of making the window is shown in Fig. 10, which will serve as a model for both sides and the front as well, the only difference between the front and sides being that tbe former is wider than the sides, though not very much. Openings must be made in the upper part of the casing, at A B C D E, and F G H K, and the interior of the casing must be rebated, as shown by the dotted lines, to receive the glass. The sill is a block of wood attached to the casing, and accurately bevelled to fit against the front of the structure and that part of the sill whicb comes in front of the window. The panel below is formed by making an external frame of thin casing of one-eighth inch stuff bevelled on the inner edge, and putting within it another piece bevelled on tbe outer edge, so as to give the appearance of a raised panel in the centre. The section of this part of the work across the centre of the panel is shown in Fig. 11, which needs no explanation. It is taken across the dotted line, Y Z. The dotted lines U V, W X, show the position of tbe edges of the top board and bottom board, to which tbe casing forming the sides and front of the window is nailed. The plan of the bold projecting sill, which should be attached by screws driven into it from within the casing, is shown partly in Fig. 12. It might have been sbown in conjunction with Fig. 11; but as tbe panelling below is butted against its under surface, tbe connection of lines might have not been understood by some. In the front elevation in Fig. 3, the top of the window is shown square, but in Fig. 10 an alternative mode of treatment is given in the low, Tudor-like, arched top at A B C. The ornamental work above the window having the appearance of a small balcony, though it is not to be taken as such, as a balcony is entered from the window in front of which it stands, is made by attaching a block or slips shown at L M to the upper surface of the top board, but flush with the outside of the casing, to which a balustrade of fret work or turned work may be screwed at the option of the maker. Within this, two imitation flower pots with imitation flowers or shrubs may be placed.

It will be noticed that the top of each part of the bay window and the panels below the sill are treated differently in Figs. 3 and 10. Tbis affords the means of showing alternative modes of treatment, the raised portion of the panels being omitted in Fig. 3, and the framing of the panels being stop-chamfered. Tbe same also applies to the French window.

This door-window is made in the same way as the bay window, but it is, if anything, easier to accomplish, being square. A rectangular piece of the requisite size, as C G H D, in Fig. 7, is taken for the bottom board, and a similar piece for the top board. These boards fit between the edges of the opening at top and bottom, as in the case of those which were used for the bay window. The sides C G, D H, are nailed to the boards at top and bottom, and the front to these and the sides. The glazing is done in the same way as the glazing of the bay window was managed, the casing being rebated in the interior, after cutting the openings, to let in the glass. The casing is finished with panels, below, in front, and at the sides, as shown in Fig. 3, and with an ornamental coping at top, within which is a hipped roof, formed of three triangular pieces of board, capped at the joints with a roll of wood, and finished with an ornament, such as half an acorn, at the apex immediately below the centre of the sill of the window above. The roofing rests on, and is attached to, the upper surface of the top board of the French window. The coping is attached to the edge of the top board, or, rather, to the casing which surrounds the top board, and rises about one-fourth of the height of the sloping roof. Small shelves are placed within this porch-like window, on which miniature pots may be placed, as shown in Figs. 3 and 4, to give it something of the aspect of a conservatory.

Here, however, I must stop for the present, leaving the method to be followed in treating the attic windows, roof, chimneys, parapet, and quoins or dressings, for a third and concluding paper.

(*To be continued.*)

BRASS CASTING AT HOME.

By F. J. DURRANCE.

III.—TURNED WORK AND CORES.

I HAVE no doubt many of our readers do not know the uses of cores in Metal Casting. In the following examples they will see various methods of application. By their use, both time and metal are saved, and in some cases they could not, on any account, be dispensed with. When a large hole is required in a casting, by putting in a core a little smaller than the hole, it has only to be filed or reamed out to size. Cores are of every conceivable size and

shape; but the two principal forms in common use are round and square. In ordinary practice they are made of loam, flour and water, etc., and dried or baked. One of their requisites is that they should be porous, to permit the gases generated during casting to escape. For our present method, we can use the mixture of coke and plaster; with this difference, there must be only just sufficient plaster to hold the mixture together.

All cores are made in what are in the trade called core boxes. For some of ours, we can do without them, *i.e.*, for round and square. To begin with round ones, obtain a ruler, glass tube, or anything round, the size of core required ; roll a piece of smooth paper round it, several layers, fasten with wax ; slide off roller ; stand vertically in some sand, or stop up the bottom with a cork, to prevent plaster running out ; now mix the compound, as above, and pour into tube, well knocking the sides, or it will not run down. Put by to dry ; pull off paper, and well dry in the oven. You can then saw off a piece the length required. Square, triangular, or polygon sections, can easily be made by planing up a strip of wood to the section required ; then proceed to wrap paper round, as before. Cores of an irregular form will be treated of later on.

As I shall mention patterns of various forms, and as no doubt many of my readers have not had much experience in the making of patterns, I will for the benefit of such give a few hints from my own experience in such matters. Firstly, the kind of wood to use. I should advise the amateurs to use hard wood in preference to the soft wood, for the following reasons : soft wood requires that all the tools used should have very acute angles, and be particularly sharp to give anything like good results ; it also easily splits, and is very liable to breakage if turned very small, whereas hard wood can almost be turned with the tools used for metal, and need not be so acute angled or sharp ; it takes a better polish, and is decidedly stronger in proportion. The kinds I use are American beech, or birch, mahogany, or in fact any close-grained wood. The most valuable pieces of wood I ever used were parts of an old wooden bedstead, which is hard as a bone and perfectly dry, therefore not liable to warp or split. Since the advent of iron bedsteads, these can be obtained from any broker's for a mere song, and is worth six times as much for the purpose as the finest new wood you can buy. We will now suppose we are commencing a pattern for the pillar, Figs. 8 and 9. Firstly, make an exact drawing of outline required, saw off a piece of wood a little longer than sketch, then split off with a knife or chopper a piece thicker than required for turning up ; do not saw it down, as some recommend, for reasons which I will now explain. This is a matter of more importance than you will imagine at the first glance. I need scarcely mention that the grain of wood runs in every direction, and when a piece is sawn down, the grain sometimes runs at an angle with the side ; if the angle is very great it is apt to break across, the greater the angle, the more liability of fracture ; and if our patterns were turned from a piece of wood prepared in this manner, it would probably break just as we were finishing it. I need scarcely say how vexatious this would be. When it is split down with the grain it is called rended ; being cut in this manner, the knife follows the line of least resistance which is with the grain, and we then get a piece of wood with the grain or fibres all running in a straight line ; and no matter how small we turn our pattern, we know there is always a certain number of fibres to resist breaking across. Some of my readers may think I have exaggerated the importance of this matter, but I hope it may give a hint to many others, otherwise than those who

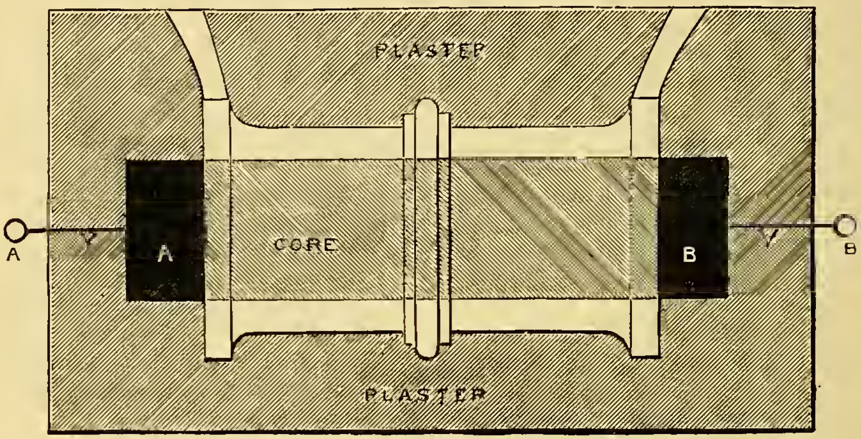


FIG. 14.—EXAMPLE OF CASTING WITH INSERTED CORE.

are following this particular subject. Having obtained our piece of wood, make a hole in each end, put it in the lathe centres, and rough down to a shade larger than the thickest portion of the pattern ; fold the drawing in two, then with a pencil mark off the various parts of the design, as it is running round in the lathe, then turn down the various parts, using the callipers to get the proper thickness of each portion, finish with glass paper, then put a little linseed oil on a piece of rag, revolve the lathe very quickly, and press very lightly on the work with the rag ; this will give it a nice polish, and make it leave the mould easily. Now cut down carefully with a parting tool, leaving the centres thoroughly defined, for a reason which you wil[l]

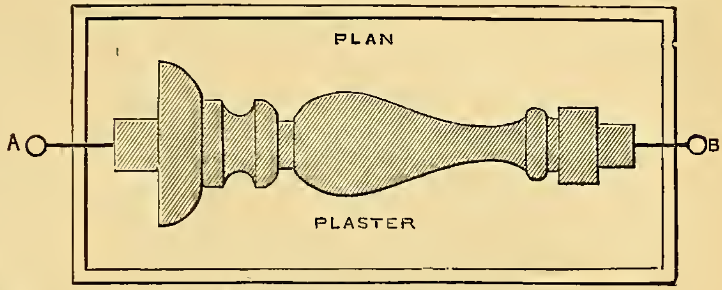


FIG. 8.—SIMPLE TURNED PILLAR—PLAN.

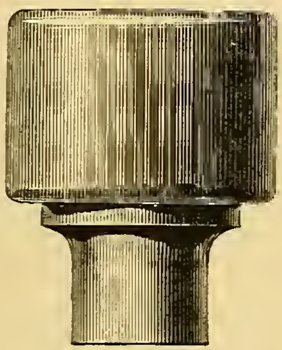


FIG. 10.—CUP-CHUCK FOR LATHE.

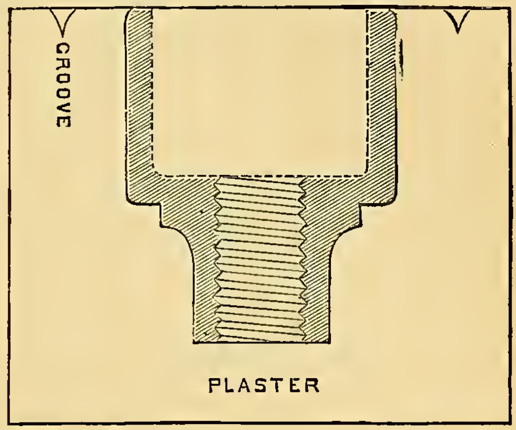


FIG. 11. — SECTION OF LOWER HALF OF MOULD WITH CHUCK PATTERN IN POSITION.

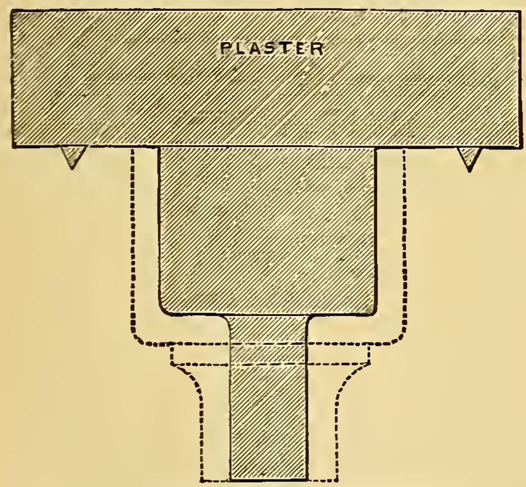


FIG. 12.—SECTION OF MOULD JUST OPENED.

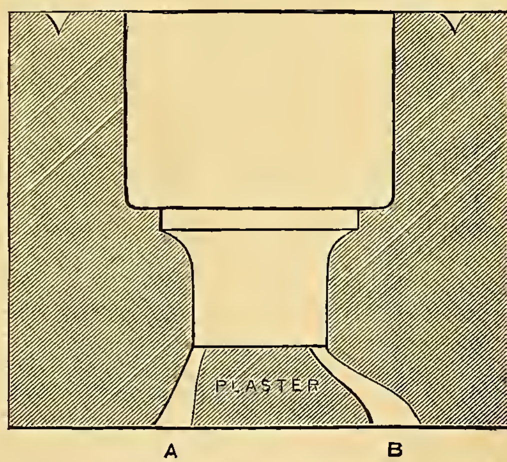


FIG. 13.—SECTION SHOWING HOLE, FOR POURING (A), VENT (B).

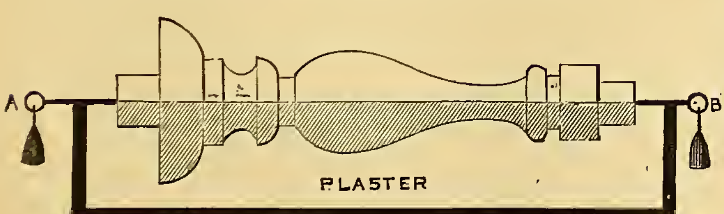


FIG. 9.—SIMPLE TURNED PILLAR—ELEVATION.

see later on. Having got our pattern, we will now proceed with making a mould for circular or turned work—cored, and otherwise. I may say, the following drawings are not proportional, but simply rough examples, embracing different kinds of work.

We will commence with a simple turned pillar (Figs. 8 and 9). When the pattern is turned, leave the centres well defined in the wood, then insert two needles, or straight pieces of wire, A, B, into them quite straight, so that the pillars on being turned round will revolve truly; get a card-board box a little deeper than half the pattern, rest the two needles on the sides, making a slight indentation for them to rest in; hang a weight on each, or tie with cotton (underneath), so that when the plaster, etc., is poured in, it will not move. You will now see the plaster will just come to the centre of the pattern (see plan Fig. 8, and elevation, Fig. 9). When dry put on top, as before, not forgetting the groove and holes for pouring and vent. The position of these I must leave to the judgment of the workman. I will just mention that they should be as near the ends as possible, and in the most unimportant parts of the casting.

There are some patterns which are made to leave their own cores, of which Figs. 10, 11, 12, 13, afford an example. In a simple cup-chuck for the lathe, which could be made into a bell-chuck by adding screws, Fig. 10 is the exterior of chuck; Fig. 11, section of lower half of mould, with chuck pattern in position. The holes should be turned a little tapering, to allow of easy withdrawal of the pattern. I have shown the hole for tapping to fit the lathe mandrel nose as cored, but I most strongly advise my readers to drill all holes under half-an-inch, as it is not worth while bothering with a core under that size, except in rare cases. The pattern is put mouth downwards into the bottom of an old paper-collar box, and filled in with plaster, as before. When putting on the top, see that the plaster goes well to the bottom of holes in pattern; dry, warm, and separate. Figs. 12 and 13 show sections of mould just opened, the dotted lines showing shape of pattern previous to pulling off mould; A and B in Fig. 13 are holes for pouring and vent. The mould is shown upside down.

In Fig. 14 I have put before my readers an example of an inserted core. In my first example—the fretwork guides—the bar itself forms its own core, but we cannot always do that; we shall generally have to make a special core for each case. All patterns for cored work must have what are called core prints fastened to them. The pattern for cylinder, Fig. 14, has two projecting portions, A and B (shaded dark) left on it. On being taken out of the mould (sand or plaster), these leave two holes, and the core is then cut to proper length, and dropped into the holes left. The metal then runs round the core, of course leaving a hole through the metal casting. I think this drawing, with the previous description, will explain itself.

(*To be continued.*)

HOUSE PAINTING AND PAPERING.

By GEORGE EDWINSON.

IV.—PAPER HANGING: HOW TO DO IT.

THE old notion handed down to us from feudal times, that anything will do for servants and dependants, however coarse and common, is now discarded by all right-minded persons, who now see plainly that the characters of human beings are largely influenced by their surroundings, and none more potent than those of their dwellings. Surround a child with coarse or hideously designed and coloured furniture, and still worse wall papers and prints, and you will find his manners coarse, uncouth, and repulsive; but place that child in a home where all his or her surroundings suggest a chaste refinement of taste, and those eloquent teachers alone will effect a reformation in the character. That which is true concerning the influence of surroundings on a child's character will also apply to the housing of servants and the dwellings of the poor; and here let me say that I am no advocate for the so-called æsthetic style of decoration, nor can I recommend the employment of gilded, carved, and other expensive ornamentation in servants' rooms, because on the one hand the æsthetic tends to destroy all natural grace by its stiffness, and richly ornamented surroundings create a feeling of unhomely strangeness, that keeps the occupant of a room ill at ease amongst them.

But there is a wide difference between this last, and the patterns of wall papers one sometimes observes in the homes of our working classes in towns and cities, and on the walls of servants' bedrooms. Why anything pretentiously decorative should be manufactured in the style designated as cheap and nasty, or cheap and ugly, cannot be easily understood, unless it be for the purpose of driving purchasers to buy the least repulsive but more costly patterns. As the coarse patterns and ugly coloured designs could only be conceived by persons with coarse and vulgar minds, it speaks unfavourably of the decorative paper trade to say that such designs are produced and sold, since it shows a sad lack of pure artistic taste in the designer and maker. Happily, each year now sees less and less of cheap ugly wall papers, and we observe more artistic designs in the cheaper grades of papers. It was argued by builders some years since that the tastes of the

lower classes led them to choose wall papers of a loud and gaudy pattern, hence these were used on the walls of their dwellings. This statement was nothing less than a hollow falsehood invented to cover the penurious sins of house owners, since it is well known that these and their agents never consulted the tastes of their poor tenants before covering the walls with paper, but bought and hung the lowest priced paper regardless of colour, or pattern, or artistic effect. This disregard for the beautiful, and for the tastes of the people, is passing away, and we now generally find agents consulting the tastes of their tenants by allowing them to choose their own patterns from several of a given price. The householder should at all times insist on this choice as his right, and in choosing wall papers should allow such considerations as the following to influence his choice.

As to Pattern.—Let the size of the room decide the size of the pattern, and its height determine the breadth of the pattern. A broad pattern with long curves in it will be suitable for a large lofty room, but would be out of place in a small room; and, conversely, a small pattern will appear lost on the walls of a large room. Avoid patterns containing geometrical figures repeated in rows when the paper is intended for the walls of a bedroom, and, for the same reason, avoid bunches of flowers, figures of animals, and parts of the human frame; all such patterns weary and annoy the eye, and, in cases of sickness, irritate the brain, thus retarding recovery. Bedroom papers should be printed with a restful pattern, such as trailing or climbing plants conventionally treated in white on a soft tinted ground. I have now two patterns by me which serve to illustrate what I mean. In one can be traced the foliage and flowers of the yellow jasmine, but printed in white on a pale blue ground, and in the other can be traced the foliage and flowers of the clematis, also in satin lustre white on a pale green ground. The jasmine paper just suits the walls of a small bedroom, and the larger clematis pattern those of a larger room, both with a south-eastern aspect. In neither of these papers does the pattern attract attention, but the whole effect is cool and restful. The jasmine paper cost 5d., and the clematis 9d., per piece of 12 yards—both cheap papers.

Next, as to Colour.—This should be chosen to suit the aspect of the room. Cool tints will be appreciated in rooms looking toward the south and west; from west to north a warmer tint should prevail; whilst those from north to east, from whence blow the coldest winds on our British Isles, should have the warmest tints, to make the walls look cheery in winter time. Some few years since it was necessary to warn purchasers against arsenical wall papers, and to condemn all those printed in the green arseniate of copper; but it has since transpired that brown wall papers were even more poisonous than the green, and that arsenic entered largely into bright blues and creamy whites. It has also been proved that the use of arsenic in wall papers is unnecessary, since most, if not all, of the colours required in colouring this class of papers may be produced without arsenic. Purchasers should therefore demand papers free from arsenical colour. It would be out of place here to describe the method of printing and colouring wall papers, or to give directions for the detection of arsenic in colours. I may say, in passing, however, that the presence of arsenic in large quantities may be detected by the peculiar garlic odour given off whilst burning the substance containing this poison.

In my last I gave the width of English wall papers, and will add here that papers of French manufacture are only 19 inches wide, and a piece of this paper only measures 9½ yards; so that in choosing French paper we must allow at least three pieces as an equivalent for two of English paper. Some persons get a roll or remnant of a roll of paper, and make their measurements with this; but I would here warn my readers against using such an unreliable measure, since paper rarely ever rolls up within the compass of its width, and we must always allow for the waste strips to be cut off wall papers. There will also be found other waste pieces, such as rumpled and torn and badly printed ends, so that we must always allow at least one piece over in buying every seven, to make up for waste, and an extra half-piece for future repairs.

Another method of measurement, besides that given in my last, is here culled from the pages of *Every Man his own Mechanic.* Measure the circumference of the room, making allowance for doors and windows, and having ascertained the number of feet, multiply this by the height of the room, and divide by the number of square feet in a piece of paper, which will be found to be 63 square feet for English paper, and 41 square feet for French paper.

Having measured the room and procured the necessary quantity of paper, we shall find on examination that each piece of paper has two selvedges, so to speak, of blank unprinted paper; one of these must be neatly trimmed off up close to the pattern in all lengths that will follow in consecutive order, and both selvedges on the lengths which will be required to finish up close to a door, or window, or in finishing the job. This trimming should be done with a pair of long scissors or shears, such as those shown in Fig. 24, and must be carefully done to avoid all marks whereby the joins of the paper may be detected when it is hung. We must therefore cut off the selvedge straight up close to the pattern, but not into the pattern. This

may be done by taking the paper in the left hand; unroll a yard at a time on the floor; trim this with the scissors held in the right hand; roll up the trimmed part; unroll another yard; and so go on until all the piece has been trimmed. But first we must decide which of the two strips must be trimmed off. Note the pattern of the paper, and decide which part of it should point up to the ceiling (of course, all foliage should have the points of the leaves upwards); then cut off all the left-hand selvedges from each piece of paper. In unrolling a "piece" of paper, we shall invariably find that the top of the pattern comes first; if we, then, cut off the right-hand edge of the paper as we unroll it, we shall ensure that each length of paper has the left-hand selvedge trimmed off when the paper is reversed. I may add here that it is advisable to cut both edges off thick papers; but this must be done carefully, leaving perfectly straight edges, for these have to be matched "butt," not "overlap," as with thin papers.

We must next cut the paper into lengths, the lengths required to reach from ceiling to skirting, and must first decide what part of the pattern must go next the ceiling. This may be a certain row of figures, or buds, or the centres of certain flowers; but, whatever part we may choose at first, this part must be strictly adhered to in all the subsequent lengths, and all around the room. Thus, if a row of stars, or buds, or flowers, are placed close to the ceiling in the first length, a corresponding row must be placed next the ceiling in the next length. If we fail to do this, we shall also fail to match the paper at the sides, and shall be annoyed to find distorted figures and flowers all along the joins loudly denouncing the clumsy paper-hanger. Therefore match each length at the top, and cut off the surplus paper at the bottom, if any be left.

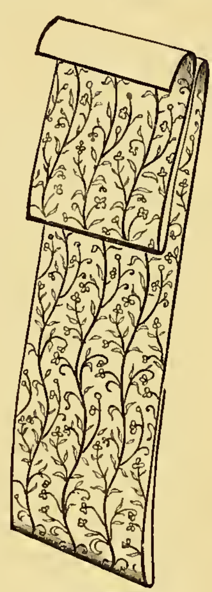


FIG. 29.—METHOD OF LOOPING UP PAPER WHEN PASTED FOR PAPERHANGING.

We shall begin to hang the paper on a plain wall, if possible, and in the left-hand corner of the room farthest from the window, and will therefore first cut off the required number of lengths, placing one length over the other, pattern uppermost, in the order in which they will be hung. After these have all been cut off, their position must be reversed, and they must be laid face downwards on the table, floor, or paste-board, for pasting. Professional paperhangers use a paste-board, constructed of two 11-inch boards, 9 or 10 feet long, hinged together, and supported on trestles; but I have used two tables placed end to end, and boards resting on backs of chairs, as substitutes. It matters but little what is used for the purpose, if we can thereby secure a long level surface for the paper to rest upon.

The paste used by paperhangers is simply the old-fashioned flour-paste, made as follows:—Put half-a-quartern of old flour into a clean pail, and mix it into a paste with lukewarm water. Have a large kettleful of boiling water at hand, and when all the paste has been well mixed, and free from lumps, pour in the boiling water, and keep briskly stirring the paste while pouring in the water; then dissolve half an ounce of alum in half a pint of warm water, and stir this well into the hot paste. If noxious insects abound in the walls, it will be well to also mix with the paste half an ounce of corrosive sublimate (bichloride of mercury) dissolved in water. But I must warn my readers that the above salt is a dangerous poison, fatal alike to insects and animals. Do not, then, on any account leave any paste about unguarded when the mercury salt has been mixed with it, and carefully wipe up all particles spilled on the floor, and burn all scraps of paper.

The paste should be allowed to cool before applying it to the paper, and must then be laid on smoothly and smartly with a small distempering brush, such as that used in distempering the ceilings, or that shown at Fig. 25. Do not thickly load the brush with paste, be careful to give all the paper a thin coating, pay particular attention to the edges, and avoid spilling the paste on the edges of the lower lengths. You must then note whether or not the commencing corner is perpendicular; if not, hang a plumb-line as near the corner as possible, and draw a perpendicular line with a pencil. Now fix the steps, or chair, or box, or other assistant to stature, in a convenient position near the perpendicular line, walk back to the paper, take up the pasted length by one of the two methods here given, carry it to the chosen corner, and hang it with one of its edges fair with the pencilled guide-line, and the selected part of the pattern next the ceiling. As a piece of paper wet with paste does not lend itself very kindly to the clutches of a novice, it will be well here to mention two methods in vogue by professionals for arranging the paper so as to make it convenient for handling.

First method. Take about two feet of the lower end of the pasted paper, double half of this back on the pasted part, and allow it to form a loop, then double back about one foot of the upper end in a

similar manner, but on the fair unpasted side, now put the two hands under this loop, walk backwards, take up the paper, carry it to the wall, judge with the eye the distance likely to be covered by the piece hanging over the hands, place the edge of the loop fair with the plumb-line, or with the edge of the piece of hung paper on the left-hand side, then press the right-hand side to the wall, pass the hands upwards to the ceiling, and fix the upper fold, then gently press the middle of the paper downward, and step down to adjust the lower loop. Draw this gently from the wall, when it will also slip down and hang straight; and if the upper part has been placed perpendicularly, the lower part will hang right. Then with a wad of soft rag or duster press gently down the centre of the length, then alternately right and left, until the paper has been pressed smoothly to the wall. If small wrinkles appear on cheap papers, disregard them, for they are probably caused by stretching whilst the paper is damp, and will probably contract as the paper dries.

The second method of folding the paper (shown at Fig. 29) is as follows :—Turn back about eighteen inches of both ends of the paper on the pasted side, and thus lightly stick these parts together ; then turn back about four or five inches of the upper part, and allow this to fall over the thumbs of both hands as the edges of the paper are held up between the fingers and thumbs. Walk forward, raising the pasted length as you advance toward the lower end of the paper, and thus carry it to the wall with the upper loop hanging over the hands. By this method the upper edge next the ceiling is stuck to the wall first, then the top loop is gently drawn out and stuck, and, meanwhile, the lower loop is prevented from sticking to the wall by the fact that its outer unpasted side touches the wall. When the upper part of the length has been pasted fair, we have only to step down, put the hands up under the paper, gently draw down the lower edge, and fix the lower part of the paper.

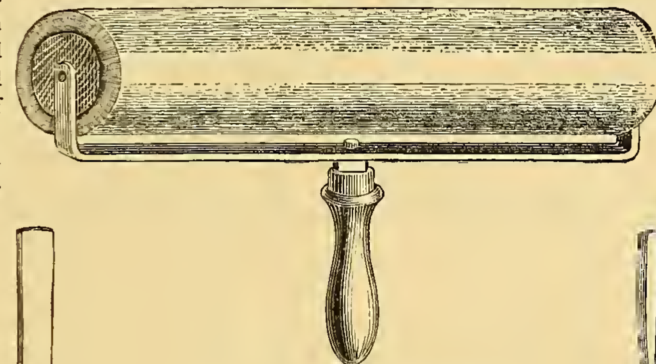


FIG. 28.—PAPERHANGER'S ROLLER.

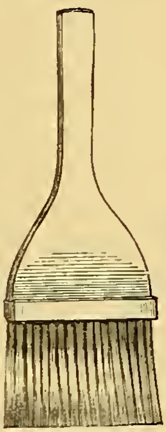


FIG. 25.—PASTE BRUSH.

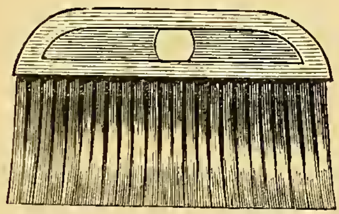


FIG. 26.—PAPERHANGER'S BRUSH.

FIG. 27.—PAPER-HANGER'S CHISEL-KNIFE.

FIG. 24.—PAPERHANGER'S SCISSORS.

TOOLS COMPRISING THE PAPERHANGER'S OUTFIT.

Avoid rubbing or smoothing the paper, because in this way it may be torn or smeared, for the colours are easily started whilst the paper is damp. Keep the hands and also the pad of rag clean ; and if any paste should be pressed out on the fair surface of the paper, absorb it at once with a clean moist rag or a wet sponge. If you do not at first succeed, pull down the length and try again. Thus go on until all the fair parts of the wall have been covered, leaving spaces over and under the windows and by the door, to be filled up with remnants. The finishing length may have to be cut on both sides, for the selvedge edge must never be shown. If the lengths have been cut too long, match the pattern at the top, draw the back of the scissors along near the ceiling to mark the paper, pull the paper away from the wall in this part, and place it back again when the surplus has been cut off to the marked line. Treat the lower part of the length at the skirting in a similar manner, and do this as the work proceeds before the paper and paste is dry.

Some paperhangers dispense with a duster or a wad of rag, and use a soft-haired brush instead, such as that shown at Fig. 26. I have tried this plan, and found that a soft-haired hand-brush or bannister-brush served my purpose best as a substitute. In using the brush, strike upwards in the middle of the paper first, then right and left up to the ceiling, then down the

middle of the paper to the bottom, and left and right downwards until the bottom has been reached. Some professionals use wooden rollers covered with flannel and chamois leather (Fig. 28). These may be bought for 2s. or 2s. 6d. each, or can be made as shown in sketch. Excellent tools for paperhangers, including the peculiar chisel-knife (Fig. 27) used in paperhanging, are made by Messrs. Hamilton and Co., 9 *and* 10, *Greek Street*, *Soho Square*, *W.*, and are sold by oil and colour vendors throughout the country.

This will finish the bedrooms on the top floor. We shall next consider the treatment of staircase down to the next floor, and the treatment of a better class of work in the best bedroom.

(*To be continued.*)

ON THE USE OF MECHANICAL AIDS IN CUTTING DOVETAIL JOINTS.

By R. J. PALMER.

AMONGST the varied operations amateurs are wont to follow, a neat joint in dovetailing is frequently wished for, but alas! for want of the necessary practice to give dexterity in the use of the saw, it is a difficulty not easily overcome, and should a venture be made, it generally turns out but a sorry job. Upon the accurate fit between the pins and dovetails depends the beauty and strength of the joint, and to accomplish this, very careful manipulation is required of the small saws used in the operation. The pins are the least difficult to make, although it is a necessity they should be cut perfectly vertical, the angle being fairly visible. With a little care this difficulty should be easily overcome; the real difficulty, however, lies in the dovetail proper, as the lines marked from the pins are arbitrary, and the least swerve from the proper position of the saw will entail a sure failure. Now to obviate these difficulties and lend a helping hand to my brother amateurs is the object of the few suggestions I am about to offer, and on the supposition that those who intend following my instructions are possessed of a fret-sawing *machine*. A fret machine with a wooden table is a desideratum, but if fitted with an iron one, as I believe most are now, it is easy to fit a wooden cover, say full ¾ inch thick over, in which case I should advise it should be square (Fig. 1). Having then the wooden table, the first requisite is to scribe, half an inch apart, parallel lines at right angles to the saw fronts, and about three inches in front of it, the wood between the lines should be grooved out, say half an inch deep, which can be done in the absence of better means—to wit, the circular saw—by paring with a

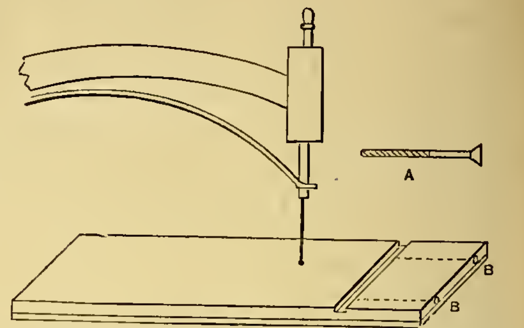


FIG. 1.—UPPER PART OF SAW AND FRAME, SHOWING WOODEN TABLE WITH GROOVE CUT. A, Wood screw for insertion at B, B, for fixing slips when in position.

chisel and finishing with an old woman's tooth. Three slips of hard wood, say mahogany, are now carefully fitted to slide freely without shake the full length of the groove; on one is screwed the block for guide in cutting the pins (Fig. 2), and on the two others the guide pieces for cutting the dovetails (Fig. 3). The figures shown in the drawings will almost explain themselves. The angle of the guide pieces should be the same—about eight degrees from the right angle is about best—but reversed, *i.e.*, right and left; these are for the dovetails proper. For the pins, the sloping block is requisite, and *must* be of the same angle, only vertical instead of horizontal, and this block must have a stop fixed on its face exactly at right angles, as shown in Fig. 2. As this block can be reversed by sliding it out of the groove and without fear of altering the angle, it is not necessary to have two, right and left. As some means of preventing the slips from moving while sawing is wanted, a couple of long thin screws (Fig. 1 A) can be run through the front edge of the table until they touch the slips and bind them fast. A better way, of course, would be to make the slips of a dovetail section, but this requires more work, and is not necessary. The use of these simple appliances will be obvious, but in case their application is not quite understood, I will describe the *modus operandi* in making a small box of mahogany, say ¼ inch thick. The wood is first cut a little larger than the finished sizes, front and back and two sides, and the faces and

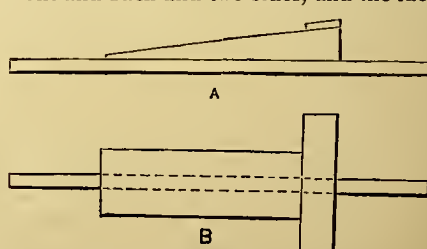


FIG. 2.—INCLINED BLOCK FASTENED ON SLIDING SLIP FOR PINS. A, Side view or elevation; B, Plan.

edges are planed square; the two ends of each piece are then shot with the plane quite square with the edges, so that they are about $\frac{1}{16}$ inch longer than required. With a sharp marking-gauge set $\frac{1}{32}$ inch thicker than the wood, scribe the pieces all round at the ends plankwise, and on the ends of two of the pieces mark with a lead pencil the position of the pins, say about $\frac{3}{16}$ inch wide at their broad side, and marking the face of the wood as a guide in sawing. The wood being marked, now proceed to saw the pins. Having placed the block in the groove, adjust it so that when the wood to be operated upon is placed against the stop fixed on the block, one of the series of marks is directly opposite the saw, either right side or left side of the pin, as the case may be; then start the saw, and make one cut down to the gauge line; move the block for the next cut, and so on for the one side of the pins. When all are cut thus, reverse the block, and cut the corresponding sides of the pins in the same way. The spaces between the pins can then

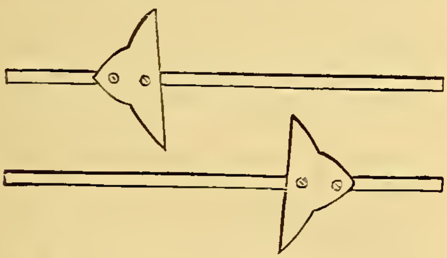


FIG. 3.—INCLINED STOPS, FASTENED ON SLIDING SLIPS, RIGHT AND LEFT, FOR DOVETAILS.

be removed either by sawing or with the chisel, taking care to keep to the gauge lines, and cutting a little *in*, in the thickness of the wood, as this makes a close joint. The dovetails are now to be marked from the pins, and to do this the piece to be marked is laid flat on the bench, and the piece with the pins placed exactly vertical, and in its intended position, and the scriber or pencil with a long fine point passed along the two sloping sides of each pin—not forgetting, in placing in position for marking, the broad side of the pin is *inside* the intended box.

The block is now removed from the table, and one of the flat angular guides placed in position, and the two pieces marked for the dovetails, sawn in a similar manner to the pins, observing that the pencil marks are almost left standing *outside the hollow*. The hollows are then removed with the chisel, and if the instructions have been carefully followed a well-fitting and perfectly true dovetail joint should be the result, requiring no after chipping and tinkering to make fit. No doubt improvements may be made, and very likely adverse criticism follow upon these suggestions; but, at any rate, the apparatus and use are so simple that the veriest tyro should find no difficulty in making a neat job of what he may hitherto have found a trouble and trial of patience, and it is in the hopes of bringing forth new ideas on the subject that I have given these hints publicity.

DECORATIVE CARPENTRY.

FOR THE ARTISTIC AND USEFUL ADORNMENT OF THE INTERIOR OF EVERY HOME.

By J. W. GLEESON-WHITE.

III.—THE DOOR—OVERDOORS.

WE now come to a very important feature, as whatever a room may, or may not have—windows, fireplace, cupboards, even ceiling—it must have a doorway, and, in nearly every case, some swinging shutter or curtain acting as a door.

In the typical middle-class house that has been kept in view throughout these papers, it has been supposed that the replacing any feature such as the door, with its attendant mouldings, lintel, etc., was not feasible. So that the question arises, how best to re-decorate and add to the existing door, that it may be made a feature of the room, and not a mere hole in the wall, for entrance, with a ready means of barring the same; which is, I conclude, the first idea of the door as a necessary structure.

Starting first with the framework of the doorway, in many cases we find it consists simply of a piece of machine-made moulding, nailed round the opening; just a bare finish to the wall-paper on either side, and in no way a feature of itself. The space around the door is, of course, as various as the doors themselves; but, as a rough rule, one might reckon on about 18 inches clear above the lintel, while the space at sides may be nothing to a 100 feet or more; so that our encroachment there must be limited to be of service for the unknown requirements of the possible workers of these suggestions. The shelf above the door, commonly spoken of for convenience and brevity as the "overdoor," is a modern revival of a habit of door treatment to be found in almost every age, and every country, in some form or another; but until its recent re-introduction, obsolete in the ordinary English home. But with the modern æsthetic school came a good many sensible common-sense-ible revivals, and many an old forgotten fancy in art and literature was brought to the light of the 19th century, to be rejudged on its own merits. This, the overdoor, is one of those fancies that revived, has caught the popular taste, and found, in some shape or another, general appreciation;

and certainly, as an inexpensive method of making a prominent feature of a necessary part of the house-woodwork as distinct from moveable furniture, it stands second only to the later revival of mantelpieces and overmantels in its effectiveness. I need not say that it may be overdone, and must on no account be made of more than its right importance with regard to the surroundings; neither should it be of richer design or decoration than the mantelpiece and other woodwork. In those I have made for my own house, I find the simplest are the most successful; not that the value of the very simplest over the door left as usual is very marked; and the additional importance of the whole house, especially in the halls or corridors, is

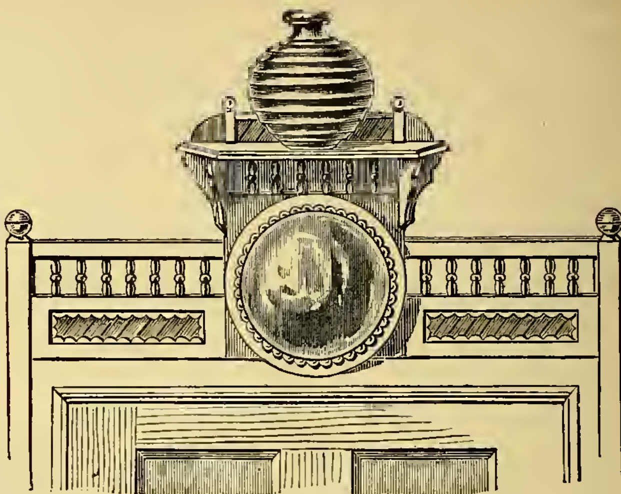


FIG. 25.—OVERDOOR WITH CONVEX MIRROR.

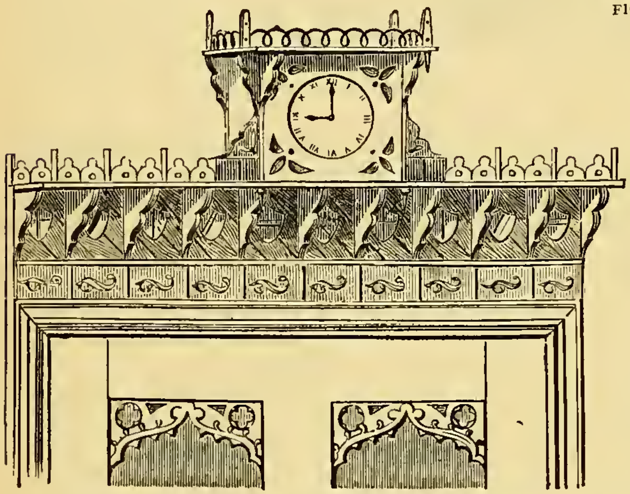


FIG. 27.—OVERDOOR IN GOTHIC STYLE WITH CLOCK.

more marked by the introduction of this feature than any other in the dwelling.

We start with the overdoor as a simple shelf placed over the door, but at once find that if placed level with the moulding it would have a tendency to depress and crush the doorway, and the brackets needed to support the shelf would be in the way, particularly when moving furniture in or out of the rooms, that in almost every case it is best to raise the line of the shelf some 8 or 9 inches above the head of the doorway. The first thing to be made is a simple framework of wood, as shown in Fig. 18; this forms the construction of nearly all the other designs; the wood should be 2¼ or 2½ inches in width, and of sufficient thickness to stand about ⅛ to ¼ inch in front of the thickest part of the moulding already there; this is crossed by two bars of same wood, mortised in, the one fitting close down to the top of the moulding, the other at sufficient height to take the tiles, panels, or other decoration chosen; the upright parts are cut out at back of the lower parts to fit over the skirting board, and, if need be, hollowed to go over the dado rail; the whole frame is screwed to the wall (there is generally a wood frame of the door proper to give a good fixing), and is perfectly stable in itself, while easily removed if needed. This framework is the skeleton in which all other parts bear, and the choice of details must be governed entirely by taste and circumstances, allowing of an almost endless variety of treatment, as the few sketches of possible overdoors given, will show. It is impossible to give

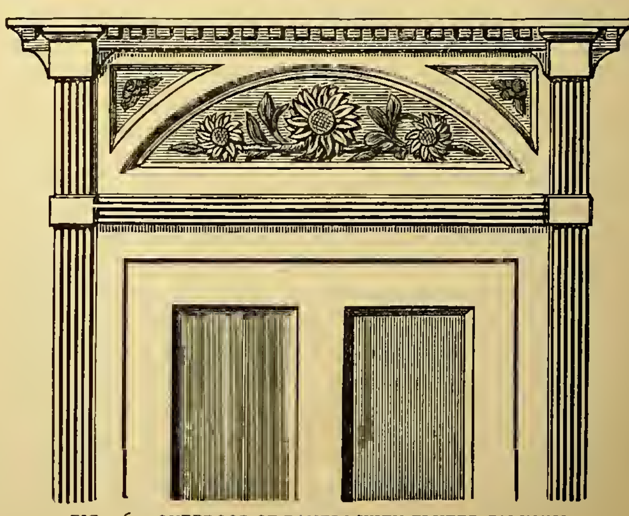


FIG. 26.—OVERDOOR OF PANELS WITH FLUTED COLUMNS.

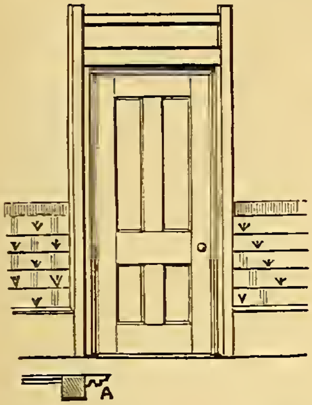


FIG. 18.—FRAME-WORK AS FOUNDATION FOR OVERDOOR.
A, Section of Upright.

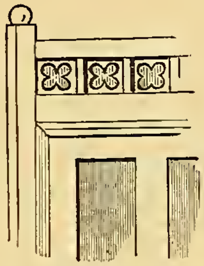


FIG. 19.—FRAME-WORK IN FIG. 18, WHEN FITTED WITH VERTICAL BARS IN ORDER TO RECEIVE TILES.

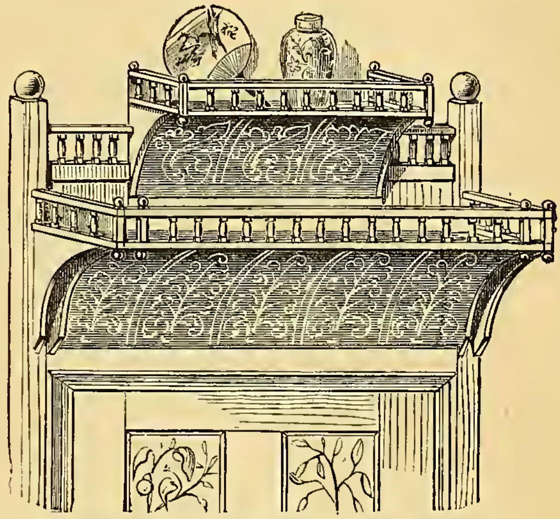


FIG. 22.—OVERDOOR WITH COVINGS OF LINCRUSTA, ETC., UNDER SHELVES.

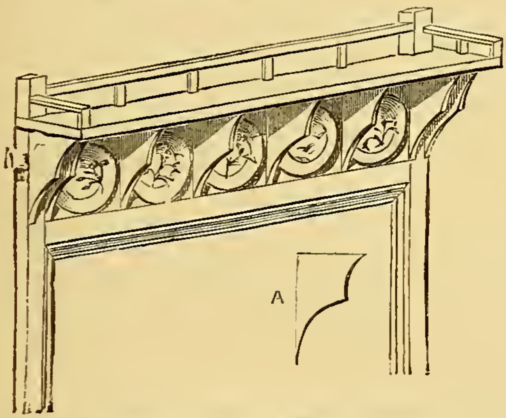


FIG. 20.—SHELF WITH SPACE BELOW DIVIDED INTO COMPARTMENTS BY BRACKETS.
A, Side View of Bracket.

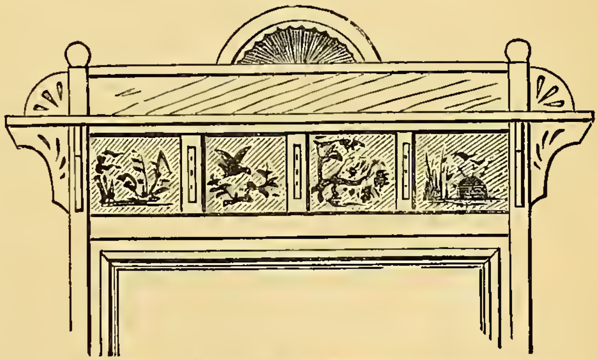


FIG. 21.—OVERDOOR VARIED BY SIDE BRACKETS AGAINST WALL.

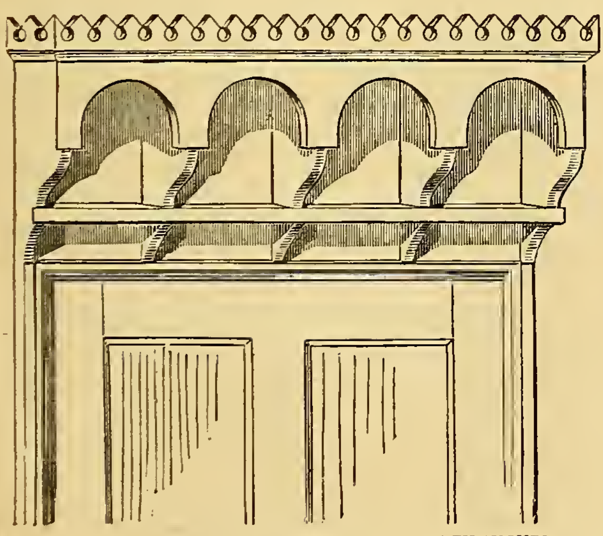


FIG. 24.—OVERDOOR IN MOORISH STYLE, WITH NICHES.

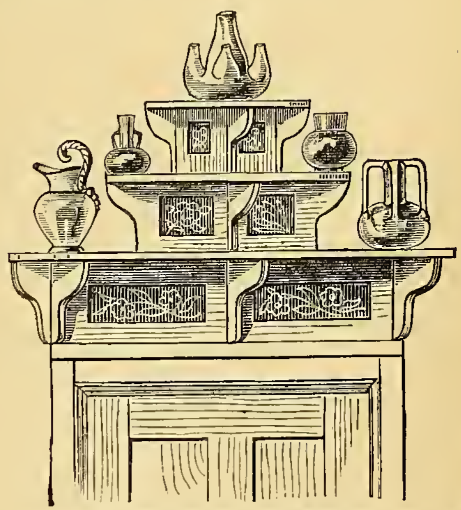


FIG. 23.—OVERDOOR SUITABLE FOR LOFTY HALL WITH MUCH SPACE ABOVE DOOR.

working drawings for these, as the size is so variable; but the construction is so simple that the merest tyro may manufacture nearly all of them if he wills.

The designs here presented give nine possible overdoors, but the details may be exchanged or omitted. In Fig. 19, the simple framework of Fig. 18 is filled with tiles, division bars being added as a working detail, it is well to remark that before making the framework, the tiles should be chosen, and the sign planned out according. By way of illustration, I measure the door nearest to hand, and find the space between upright lines of post is 38 inches in width. If eight inch tiles are chosen, it will be only possible to have four, and the division bars five, including each end, or three if preferred; but be respectively either one-fifth or one-third of the four inches left over the thirty-two taken up by the tiles. If six-inch tiles are chosen, the choice would be between six tiles with bars only $\frac{2}{5}$ of an inch wide; or five tiles with bars rather over an inch and a half. If the design included brackets between each tile, the wider bar and fewer tiles must be chosen; but if only end brackets bearing on the upright posts are wanted, then the greater number of tiles, with their divisional bars would be the most effective. It will be seen that the size of brackets is also governed by size of tiles, as 6-inch tiles would only require 7-inch brackets, and with 8-inch tiles would want 9 or 10 inch ones.

In Fig. 20, the spaces are left square, as for tiles, but a small plate held by tin wire pins is placed in each. When a set of small plates is available, they look very well in this way; the shelf is fixed above top rail of skeleton framework. Brackets doubled, about $\frac{1}{2}$ inch apart (and of a slightly larger size than the others), carry the shelf, which is also supported by brackets dividing each square.

A simple railing of square rods surmounts the whole if needed. This railing, if in front, would save the bric-a-brac from a downfall, but I have never known it to happen, let the door bang never so violently, unless an object has been placed in an insecure manner. If plates are placed standing against the wall, they should slope slightly and be guarded by a small nail, half driven in, to prevent their sliding down and clearing away the etceteras in front, amid much noise and damage.

The overdoor in Fig. 21 is varied by the brackets at side flat to wall, carrying a larger shelf; five equal size ones are used, and tiles between, as shown. A back-board against the wall at the back is also in keeping with this form.

In Fig. 22, a different plan is suggested; the brackets here assist in supporting a coving of lincrusta, or other flexible material. This is repeated in the upper story, and turned balustrades added to the shelves.

This style is given to harmonize with the very popular style that has been done (rather overdone) of late, and finished in black and gold, with the lincrusta gilded, or Japanese gold leather paper on the cone, would be in good keeping with drawing-rooms of the so-called "Early English Style." Why Early English, it is very doubtful. Surely no former age has ever broken out into a furniture eruption of epidemic balustrades and balconies, to the extent of the present attack, whereby a pleasant fancy has been almost rendered as hackneyed as the walnut and green of its near predecessor.

In the next Fig., 23, a design is suggested, specially adapted for a door in a hall or passage, with plenty of wall space above, and in full view of passers-by up and down the stairs. One often finds such a door, and sometimes within reach of the dusting and arrangement from the staircase without a climb (rather a weak point in overdoors as a rule). This style of shelf might therefore partake more of a series of steps as shown, or shelves, than the more simple ones with less available space.

In Fig. 24, a novel, yet strictly wooden treatment is shown by a series of niches, somewhat Moorish in their style, and lending themselves to any painted decoration, or effective in plain colour, which, showing the objects placed, they yet screen them somewhat from the dust. The shelf at top is also available, if needed. The whole is of the plainest, simplest construction, a key-hole saw and centre-bit working the cresting easily.

In Fig. 25, the leading idea has been to utilize one of the old convex mirrors for the centre portion, while a shelf and brackets make a sort of canopy to it above. This so depends upon the mirror, or circular bas-relief, or other round centre panel used, that the proportions can be only suggested as in the sketch.

In Fig. 26, a conventional form of old use is given. Those who have not the tools for working the fluted column, may gain a similar effect by laying on thin strips of wood at equal distances, glued and fixed with needle points; when painted, the effect is almost the same as square flutes cut in the wood, or half-rounded pieces may be placed side by side, to give a needed effect.

In Fig. 27 heraldry is introduced as a prominent feature, and renders this, or similar overdoors, exceedingly adapted for a library or drawing room in Gothic or similar style. Fig. 27 introduces a space for a clock as the main feature. The details of this are intended to be carried out in fretwork, the door panels being treated in accordance. I shall resume the subject in the next chapter. The treatment of the door and its panels will be considered in a future one.

(*To be continued.*)

A HANDY PORTABLE LARDER.

By J. T. FINCHETTE.

It may have occurred to many of the readers of this Magazine as it has to the writer when engaged in the pleasant occupation known as house-hunting, of the remarkable absence in many of our middle-class houses of a proper, and if only from a sanitary point of view, suitable, receptacle for the provisions of a family. In journeying with a friend bent on an expedition of this nature, it was noticed that in houses, the rentals of which were in some cases upwards of forty pounds a year, no provision whatever was made for the wants of a tenant in this respect, beyond the dark, gloomy cupboard of the kitchen, at once the home and happy hunting-grounds of mice, beetles, crickets, and a numerous host of other small fry.

In the few cases in which such accommodation was found, it was cunningly contrived to be as near as possible to the water-closet of the establishment, in some cases the windows of both ventilating one into the other, and invariably near a gulley hole imperfectly trapped and communicating direct with the sewer: a wonderful instance of the proficiency of the modern jerry builder in not doing what ought to be done. To meet this want the writer designed and constructed the portable larder here sketched, which I have little doubt will be found a real treasure and comfort in suburban houses of six and seven rooms, and where no such accommodation exists; while for those who are already provided for in this respect, it will be found no mean addition to any kitchen, as it is both easy and simple in construction, and may be varied to suit the particular requirements of different individuals.

In the present case, time and economy being the principal objects, the writer used match-lining for the whole concern, the jointing of which in a measure rather added to its appearance when complete. It will take for the job a 20 feet length ⅝th match-lining and a 24 feet or two 12 feet lengths of the same, also a strip 2 inches by 1 inch, for the outside frame, A A; another strip, 1½ inch by 1 inch, for the frame of door, which, with a length of moulding, completes the timber required for it. To construct it, take the 20 feet length, and cut it up into ten 2 feet lengths, these join up by simply matching them one into the other, and be careful to get them all right side out. You will then have the top, bottom, and shelves of the case, now cut the 24 feet or two 12 lengths, as the case may be, into equal lengths of 3 feet each, which will be eight lengths in all, join these up in the same way as the others, putting four together for the back, and two each for the sides; in putting together, first nail the sides on the top and bottom, previous to which, however, mark the inside of sides as shown for position of shelves, and mark lightly outside to show position of nails, turn over and nail on the back, take the remaining 2 feet lengths, and run the plane along, and take off the tongues, the object being to allow them to stand clear of the door, and permit a current of air to reach all parts of the structure. With the strip of wood, 2 inches by 1, make up a frame exact size of outside of the carcase. This need only be halved at the corners, glued and screwed up, and either nailed or screwed firmly on all round; if screws are used, the heads must go below the surface and puttied up. Cut the moulding up to fit the two sides, top and bottom of front, mitring the corners very cleanly, tack up all round with fine brads. The remaining strip of wood, 1½ inch by 1 inch, will make the door. This should be mortised, as the greatest strain will be here; but for those who do not care to go to the trouble or perhaps accomplish it to their satisfaction, it may be halved as the frame, glued and screwed up, a pair of 2 inch butt hinges and small brass lock will also be needed. The constructural part finished, proceed to punch down all heads of nails, and with a lump of putty stained with a little oak stain, fill up the nail-holes, screw-holes and all other imperfections; when dry, rub well down smooth with fine glass-paper, leave no putty sticking on the woodwork, or it will interfere with your staining. Procure a bottle of Stephens' oak stain, and with a flat camel-hair brush go well over the sides, front, both sides of door and edges of shelves, if not dark enough, give it two coats as even in shade as possible; let your brush be fairly full and work quickly, use a coarse brush on the ends of wood where it is cross-grain, dabbing the

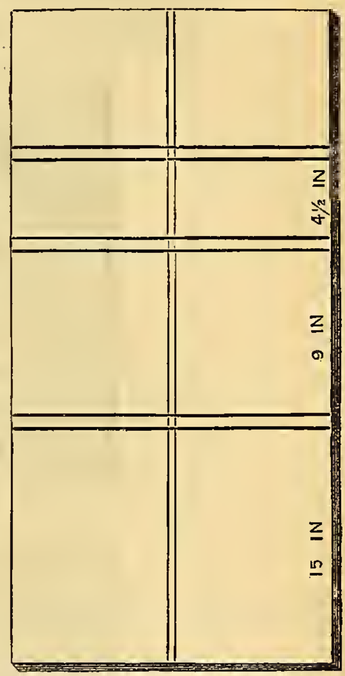


FIG. 1.—DIAGRAM OF SIDE MARKED OUT FOR SHELVES.

stain well in, and repeat if necessary; let it stand twenty-four hours, procure half-pound patent size, 2d. a pound, put in small saucepan with little water on hob, when melted it is fit for use; don't boil it, it must only be warm. With the camel-hair brush go all over the case again; when it is dry you can proceed to of zinc, $1\frac{1}{2}$ inch by $\frac{1}{2}$ inch, bent hook shape, two to each panel, and the top is secured in the same way. This is simpler than cutting rebates, and, for those who have not the tools, or ability, answers just as well; a piece of felt or baize half-inch wide should be gummed all round where the glass rests, this prevents any

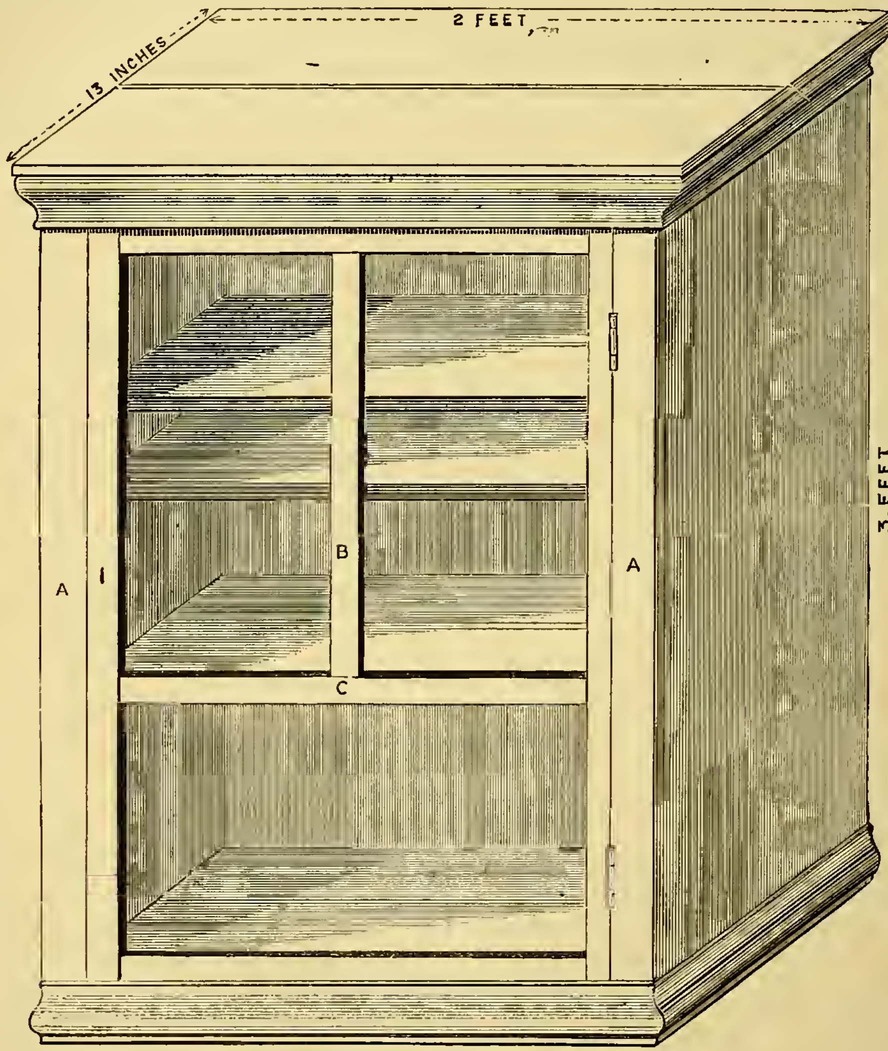


FIG. 2.—HANDY PORTABLE LARDER, COMPLETE.

varnish it, using hard oak varnish. This operation should be done in a warm room, free from draughts if possible to avoid chilling the varnish, allow it to dry thoroughly hard before touching it again. Then proceed to complete the door by tacking inside the bottom panel a piece of perforated zinc; in the upper panels fix two squares of embossed glass, let these be cut half-inch each way larger than the space of panels, the bottom edges of which rest on two pieces rattling of the panes, bedding it in, as it were. It is now complete and ready for use, and a most useful article, and withal so simple in construction, that the merest tyro can put it together; while for those whose ambition is higher, it is capable of various modifications from a more artistic point of view,—for example, it would form a useful book-case fixed on a stand or small table. Round the front and sides at the top an ornamental ridge and fretwork gallery could be

fixed with two panel doors opening in the centre, filled with plain glass, and the back fluted blue silk, like a piano-front or the Glacier decorations for windows could be introduced with good effect. The shelves instead of being nailed in should rest on runners or supports, making the shelves movable to take various sizes of books; many could contrive it with drawers for a cabinet of curios, coins, old china, and so on. One more suggestion: that is if fixed out of doors, the top should be covered with a piece of sheet zinc or thin lead to preserve it from the effects of the weather. Total cost, 7s. 6d. for materials only.

AMATEUR AND PROFESSIONAL WORK CONTRASTED.

By JAMES LUKIN.

THE pages of this Magazine are, as is now well known, specially dedicated to the world of amateurs, by whom, I may further say, the work thus far has been well appreciated, and is of increasing popularity. But at the same time it has always been sought to convey to the readers instruction of such reliable and practical character, that even professional workmen may gain here and there valuable items of information. Sometimes an attempt has been made to bridge over the gap which separates the two great classes of mechanics—to remove the stigma which somehow hangs about the very word amateur. But the task is a difficult one, if not hopeless. Some venture to say that all amateur work is so essentially bad that a practical mechanic can tell it at a glance, and therefore treats it with a mere contemptuous glance, as being unworthy of criticism. Others, obliged to confess that some amateurs really do attain excellence in mechanical manipulation, consider that mere jealousy leads the professional to despise work not done by one of his own tribe, and that it is not really so much a question of skill as of caste, the *Ne sutor ultra crepidam* being in this case a double-edged sarcasm. Undoubtedly we have amateurs who have risen superior to the name—a few who at file and lathe can compete on equal terms with our best fitters. But why? Because in point of fact their actual training has been the same. They have gone patiently through the drudgery of apprenticeship, only without articles or legal bonds. Many were taught in their youth at King's College, London, or other educational establishments where workshops have been established for the amusement and instruction of the students; others have laid out dollars for the privilege of attending private tuition at Holtzappfels; while not a few have paid the village carpenter and blacksmith for a few lessons in their respective crafts. But the great majority have been compelled to hammer out their mechanical knowledge at the anvil of laborious practice, learning the art of success by repeated failures, and conquering difficulty by dogged perseverance. AMATEUR WORK was started to help such as these by preventing them from expending their praiseworthy energies in a wrong direction, and it is certain that the efforts of the writers have been by no means unrewarded. But in spite of this, the amateur, as a class, is still too far in the background among handicraftsmen, and I hope in this paper to lay bare the secret of his equivocal position, and, if possible, to help him to a sounder footing.

To look the matter fairly in the face, is his work good or bad? *Normally, it is bad.* I need not discuss the question whether the same is not frequently true of professional work. At the present moment, within fifty yards of me, I could point to work of professional carpenters, bad enough to disgrace even a second-rate amateur. The latter is, however, exceptional; the former, unfortunately, the rule. What then is the matter with this amateur work? In a word, it is muddled. Take first a bit of simple woodwork, a set of very plain shelves. The front edges alone betray the workman. One is flat, another is rounded, a third doubtful. They are of deal, stained and varnished; but no stain will conceal the fact that the flat surfaces are as badly planed as the edges. Instead of being one plane, there are dozens of varied elevation and shape. Apparently the plane iron, instead of being level, was curved, so that in reality the surface of the work is covered with a series of broad grooves or hollows, so that a straightedge will only touch here and there where it rests upon the tops of the multitudinous convexities. The shelves have been let into the sides about half an inch, or perhaps somewhat less; but the grooves are not all of equal depth or width, nor have the ends of the shelves been sawn off squarely, so that some shelves show a gap above as if they were of thinner board, and others display similar defects at their ends, as if cut too short, which is very probably the fact. Moreover, the shelves are not exactly horizontal in every case, being, some one or two of them, wider apart at one end than at the other.

These are just the sort of defects which are so common, and as I have myself plodded through the mire of similar failures, I can determine the origin of the same. First and foremost, the plane was out of order. Good work is hopeless unless both long and short planes are ground and sharpened properly. The jack-plane iron having to do the rough work, should have a somewhat rounded edge, projecting

rather more in the middle than at the corners. This will make a series of hollows of very wide curvature, and remove without undue labour the rough outsides of the sawn boards. But following this should come a plane with perfectly level sole and iron, true as a straightedge, the corners alone being just eased off to prevent their marking the surface ; and, lastly, where necessary, comes the smoothing-plane, set as finely and sharpened as keenly as possible, with which the final touches are given, the shavings from this tool being thin as tissue paper, and every stroke tending to polish the surface of the board.

The two side boards having been thus finished, the edges need consideration. They may be flat (or square, as it is called), bevelled, or rounded ; but whichever is chosen, let the result leave no doubt as to the intention of the workman. In any case, it is necessary to make the edge truly square to the sides first of all, and it is here again that defects meet the eye. The amateur is sure to find this a difficult job, and it is so in reality. The plane has a tendency to roll sideways during its long journey, because the tool is a heavy one, and it rests upon a comparatively narrow track, which, being itself uneven till corrected, is but a blind guide to the sole of the plane, leading it astray. The amateur meets with this difficulty, and too readily seeks a compromise ; so, finding that a rounded edge is suggested by the erratic wandering of the plane, he yields to the temptation, and allows it to have its own way. Probably he concludes that when all is put together no one will notice the defects in this unimportant part of his work.

Very probably other of the failures alluded to have arisen from careless use of the saw. Possibly the tool again is out of sorts. Very likely, instead of being kept for the legitimate uses of the workshop, it is the hack-saw of the premises, and I say at once it is useless to attempt carpentry with a tool whose edge has been making researches into the penetrability of the metal. But if such is not the case, and the saw was in good condition, and the work accurately marked by square and rule, then the marks have been cut into, instead of being left upon the work, whereby the guide lines so necessary for final adjustment have been obliterated.

Sawing requires great care, and the common fault of the amateur is too heavy pressure, and too quick speed. The channels or grooves have evidently been sawn thus carelessly, some few of the scribed lines being evident, some wholly cut away, some (where the track is crooked) partially obliterated. Now, I think, by a general survey of these shelves, that the amateur joiner had the requisite skill, but was wanting in patient care and painstaking. Evidently he was in too great a hurry to get his job finished, and the result of his impatience is that his work bears the ineffaceable trademark of "amateur."

Another piece of work lies before me for criticism, upon which I do not wish to be too severe ; but by sheer compulsion and stress of circumstances, I must be more just than generous. This is a model steam-engine, with apparently a 2-inch bore of cylinder and 3-inch stroke. It is not a 2-inch bore ; but we are told that such is the belief of the maker ; and we will take the length of stroke for granted. A casual or general inspection gives us an impression of a somewhat battered engine, new as it is. It has, evidently, been taken to pieces a good many times during its construction, for the slits of the screw-heads are widened and burred ; and, on inspecting these more narrowly, we notice that all do not bed down fairly and evenly. One or two in the cylinder cover are guilty of this defect, and show that the hole in the cover does not exactly tally with that in the flange of the cylinder ; and, perhaps, the latter has not been tapped truly, so that the screw is forced to lie at an angle other than a right angle to the face of the work.

Now, if one hole had been drilled and tapped, and a temporary screw put in to hold the cover in place while the rest of the holes were being drilled a little smaller than ultimately required, and a five-sided reamer had then been used to correct any deviation of the drill, the holes would have been made true to each other ; and a larger reamer subsequently passed through the holes in the cover would have given the necessary free passage to the screws.

As to the screws themselves, they should be bought ready made ; but while the engine is being fitted, a job set should be used, and when all proves satisfactory, these should be removed to give place to an entirely new set. It is astonishing how much work is spoiled by bad drilling, the holes failing to come truly opposite to each other. A broach should always follow a drill in small work like these models, as well as generally in that of more importance.

Another defect is evident. The cylinder cover ought so to fit that only a fine line appears where it touches the flange of the cylinder upon which it rests. In the present case it does not fit accurately, and the edge of the cover and flange is not quite square and well finished. No doubt one or the other is not turned quite flat. No! on removing the cover we find it decidedly convex on its under side, and very roughly turned, evidently under an impression that it will not be seen ; or, perhaps, it was intended to use a paper washer, or a little red lead, to make the junction quite steam-tight. The trademark is, however, here stamped plainly enough. Five minutes more at the lathe, with careful testing of the turned surface, would have prevented this defect. The *capability* of good fitting on

the part of the maker is evident, because the lower cylinder cover is a very good fit indeed, and the edge of the flange is square and true, as it ought to be, with just the sharp arris removed, as it ought to be.

The piston rod was not turned, as a bright bar of steel was used, such as we can readily obtain; but its appearance is spoiled by very evident marks of the vice, by which it has been held while the screw was cut for securing the crosshead. Here, again, it would have been just as easy to provide the jaws of the vice with copper, or leaden, or wooden clamps, which would have held the work tightly, and not bruised it.

The guide bars for parallelism show the same fatal vice marks, and, in addition, belie their name. Not being parallel, the crosshead was found to bind at a certain point at each stroke. Hence the holes in the brasses have been "eased a bit," to allow more freedom, and are no longer round. The fly wheel is well turned, and so is the axle; but the hole in the former being a trifle large, the key has driven the wheel a little to one side, so that it does not run exactly true.

The engine will work by steam fairly well, though a little fitfully, showing a slight strain at one or two points; and I have seen far worse models. But that it is amateur work no judge of mechanical fitting would doubt for a single moment, because of the above defects, and others of similar character. As I am not describing the actual process of model-making, I have merely hinted at the cause of the various defects exhibited; but these are such as always exist, more or less, in an amateur's work.

Are they, or are they not, avoidable? Of course, something depends upon the skill attained in the manipulation of tools, and no one would expect a perfect model to be turned out by one who, amateur or otherwise, is but a 'prentice hand. But I am not now alluding to the work which is manifestly only that of a tyro, but to such as comes from the workshop of one who has had a fair amount of practical experience, but who yet fails to rival a professional workman of no special talent or ability.

We have glanced at what a somewhat extensive acquaintance has shown us to be the general fault and cause of failure in amateur work. The fault is not, as a rule, one of unskilfulness or inability to use the tools of the fitter; but solely such as care and patience would remedy. AMATEUR WORK contains much information in the practical use of tools; but this cannot give the amateur patience, and unless he steadily determines to eschew the faults which I have briefly pointed out, it is of little moment whether he reads one number or all that have been issued up to this time, and the practical press generally. But as the amateur's sincere friend and would-be adviser, I am most anxious to help him to remove the stigma which undoubtedly, and not undeservedly, attaches to his name. In the present day his class is one which, from its numbers alone, keeps prominently before the public. The facility with which he can now obtain his tools and workshop appliances,—the numerous firms devoted to supplying his multifarious needs,—the journals more or less devoted to his benefit,—all should urge upon him the ceaseless endeavour to remove that slur so long cast slightingly upon the products of his labour:—It is only an amateur's work.

WAYS AND MEANS.

CEMENT FOR GLASS.—To make a cement for glass that will resist acids, the following has been recommended: Take $10\frac{1}{2}$ pounds of pulverized stone and glass, and mix with it $4\frac{3}{4}$ pounds of sulphur. Subject the mixture to such a moderate degree of heat that the sulphur melts. Stir until the whole becomes homogeneous, and then run it into moulds. When required for use it is to be heated to 248°, at which temperature it melts, and may be employed in the usual manner. This, it is said, resists the action of acids, never changes in the air, and is not affected in boiling water. At 230° it is said to be as hard as stone.

DECORATION OF IRON AND STEEL BY COPPER PRECIPITATES.—The method to be adopted is as follows:—7 parts of copper sulphate, or any other copper salt, are dissolved and treated with an alkaline base, which precipitates an oxyhydrate. To this precipitate is added a solution of 30 parts of Rochelle salt, and finally 200 parts of water are introduced. When this solution has clarified, about 12 parts of caustic soda are added. The article to be coated with copper is first immersed in an alkaline bath and thoroughly cleansed with a stiff brush, after which it is immersed in the copper solution. Great care must be exercised in this operation to prevent a too rapid deposition of the copper. When the solution loses its strength, an additional quantity of hydrate of copper should be added, the amount of which must not, in any case, exceed the figure given above. By properly regulating the deposit of the copper, highly artistic effects may be produced and different shades of colours obtained, such as red, green, blue, violet, etc. Such parts as are required without any copper deposit, are simply covered with a layer of paraffin or varnish, which is readily removed after having taken the body from the copper bath.

VARNISH FOR IMITATING GILDING.—A very perfect imitation of gilding on brass and bronze articles, it is said, may be made by means of a varnish composed of 80 grains of gum-lac, 20 grains of dragon's blood, 5 grains of turmeric, and 1660 grains of alcohol. The metal should be brushed with the varnish in all directions, by means of a sponge, and then immediately warmed over a gentle charcoal fire. The surface at first will appear dead, but will soon resemble the finest gilding. The varnish should be kept in well-corked bottles.

NOTES ON NOVELTIES.

COUNTRY readers on a visit to London should on no account omit to pay a visit to Messrs. Charles Churchill and Co., 21, *Cross Street, Finsbury, E.C.*, for the purpose of inspecting their well-stocked show-room, which is always kept up to date with the latest novelties in toolmaking that have been produced on the other side of the Atlantic, by the inventive brains and cunning fingers of practical Americans. In common with the great majority of his countrymen, Mr. Churchill himself is always courteous and ready to do the honours of his show-room, and explain the working and construction of any tool or piece of machinery, and answer any questions, oftentimes, I fear, to his own hindrance, when it is desirable for him to be turning his attention to weightier matters He is now preparing his new catalogue, which will be duly announced, when ready, in these pages, and many of the novelties mentioned therein described and illustrated. In the meantime, I may call attention to two or three new things which cannot fail to prove interesting to amateurs.

FIG. 2.—CYLINDER LOCK.

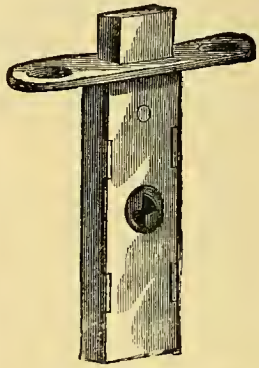


FIG. 5.—RECESS LOCK.

FIG. 4.—KEY-WAY.

FIG. 3.—FLAT REVERSIBLE KEY.

The screwdriver illustrated in Fig. 1, is an instrument which perhaps differs little from one of ordinary construction, as far as mere form is concerned, but which is made on a plan which renders it infinitely superior to the common screwdriver. Now, as all amateurs know, the common screwdriver consists of a blade, with a wedge-shaped termination at the upper end, and rigidly fixed in a wooden handle, fitted with a brass ferule at the place where the tang of the blade enters the wood. The firmer the blade is fixed in the handle, the better calculated to do its work is the screwdriver held to be; and to ensure the desired rigidity, the shoulders of the blade just above the tang, are sometimes let into nicks cut in the ferule to receive them. The distinctive feature, on the contrary, in the new screwdriver now under consideration, which is manufactured by Messrs. Gay and Parsons, *Augusta, Maine, U.S.*, on Mr. Gay's patent, is the mobility of the blade, which renders it far easier to work with than the common screwdriver, in using which it is necessary to shift the hand at every half turn of the screw, and to continue to do so until the screw driven home. The grasp of the hand, in fact, must be relaxed, the position altered, and the grip renewed at every half turn of the screw. The handle of the Gay screwdriver is fitted with a ratchet arrangement let into it immediately under the oval plate shown in the drawing. This arrangement acts on the blade which issues from the handle through a well-made and closely-fitting brass socket, in three different ways: thus, when the button that appears on the plate is exactly in the centre of the slot in which it works, the handle is rendered immovable, and the tool can be used like an ordinary screwdriver; when it is pressed *downwards*, I use the term in relation to the position of the screwdriver in Fig. 1, or to the *left*, when the tool is held upright, the end of the blade uppermost, in front of the operator, the blade is movable and in the proper position for driving screws into the wood; when it is pressed *upwards*, according to the position of the tool in the drawing, or to the *right* when held end of blade upwards in front of the operator, it is properly regulated for the withdrawal of screws. Instead of moving the hand, as when using the ordinary screwdriver, the blade remains in position, fixed in the nick of the screw, but the handle being movable, is brought by a twist of the wrist into the proper position for the next half turn. The handle turns and the hand turns with it, but the grip of the handle is retained, and the relative positions of hand and handle are maintained until the operation is completed, and the screwdriver put out of the hand. The Gay screwdriver is well made, the blades being of the best steel, nickel plated, as is also the plate and button which conceal the ratchet arrangement in the handle, which is made of ebony.

FIG. 1.—GAY'S DOUBLE-ACTION RATCHET SCREWDRIVER.

The sizes in which this capital addition to the contents of the tool-chest is made, and their relative prices are as follows:—4in., 3s. 3d.; 5in., 3s. 9d.; 6in., 4s. 3d.; 8in., 4s. 9d.; 10inch, 5s. 3d.; 12in., 5s 9d.

In Figs. 2, 3, and 4 are shown a new kind of lock, key-way and key, manufactured by the Stoddard Lock Company, and sold by Messrs. Churchill and Co. The lock illustrated in Fig. 2 is what is termed by the manufacturers a cylinder lock with two tumblers, suitable for drawers and for other purposes, for wood from ¾ inch to 1 inch in thickness. The great novelty of this kind of tumbler-lock is that no screws or nails are used in fastening them. An inspection of the

engraving, in which the lock is represented with tbe bolt shot, or, in other words, locked, will show that it is perfectly cylindrical in form, having a projecting flange on each side, or rather on opposite sides of the cylinder, and a flat face-plate at the top, through which the bolt works. Though made in different sizes as far as length is concerned, from $\frac{5}{8}$ inch to $2\frac{1}{2}$ inches, the size being determined by the distance between the centre of the key-way and the under surface of the face-plate, the *diameter* of each side is the same; and to insert tbem in place in the wood, all that is necessary to be done is to bore holes for the body of the lock, the face-plate, and the key-way, with regular size bits, one of $\frac{11}{16}$ inch being used for the face-plate, $\frac{9}{16}$ inch for body of lock, and $\frac{5}{16}$ incb for key-way. The *modus operandi* may be described as follows: Tbe centre of the upper edge of tbe front of the drawer heing determined, the point of the $\frac{11}{16}$ inch bit is inserted, and a hole bored just deep enougb to receive the face-plate, its upper surface being flush with the surface of the wood. The $\frac{9}{16}$ inch bit is then taken, and the hole is continued until it is deep enough to take the body of the lock. The flange of the face-plate left on the ledge formed by the first boring with tbe $\frac{11}{16}$ inch bit preventing its downward course too far, even if the hole be made a little too deep. The lock represented in the engraving is what is called a 1-inch lock, this being the distance between the centre of the key-way and the under surface of the face-plate. A measurement of 1 inch + the thickness of tbe face-plate must be made down the surface of the drawer from its upper edge, and a hole bored for the key-way with a $\frac{5}{16}$ inch bit. Grooves are then cut in the hole made to receive the lock with a V cbisel, or even an ordinary chisel or knife, the object of the grooves and the flanges of the lock that enter tbem being to bring the lock into its proper place, and to prevent it from being moved; the grooves must be in a line exactly parallel with the front of the drawer. When this has been done the lock is merely thrust into its place, the key-way inserted, and the whole is ready for use. The key used for these locks is a flat piece of metal, properly shaped at the bottom to suit the lock; it is far less cumbersome, and occupies much less room in the pocket than the ordinary pipe key used in this country for drawers, etc. Each lock and key is lettered, and if the keys are lost they can be replaced without any trouble, or extra keys supplied, by sending the letter on side of lock or key. The locks are made of brass, and are supplied witb or without nickel plating. The prices of the sizes of the lock shown in Fig. 2 are as follows, per dozen:—

	$\frac{5}{8}$in.		$\frac{3}{4}$in.		1in.		$1\frac{1}{2}$in.		2in.		$2\frac{1}{2}$in.
Brass, ...	13s.	...	13s.	...	14s.	...	16s.	...	18s.	...	20s.
Nickel plated,	17s.	...	17s.	...	18s.	...	19s.	...	21s.	...	23s.

Recess locks (Fig. 5), equally good and cheap, are made on the same principle, but rectangular in form, from $\frac{1}{2}$ inch to $\frac{3}{4}$ inch in thickness. The $\frac{5}{8}$ inch are sold at the same price as the cylinder locks of this size, but the larger size are 1s. more per dozen. Instead of the key-way, the patent key-hole Drawer Pull, supplied by the Company, may be used. In this the key-hole is in the centre of a projecting boss in the middle of a square plate, which, of course, must be fastened to the drawer with screws, the ring-shaped handle is inserted in the boss, apparently springing from it on either side of the key-way. The price of the Drawer Pulls is 14s. per dozen, gilt or nickel plated.

I daresay many amateur gardeners have found themselves at a loss for means of sharpening the knives of the lawn-mower. With the "Challenge Lawn-Mower Sharpener," sold by Messrs. Churchill and Co., at 4s. each, any man can sharpen his own mower without taking it apart, and further, it requires a few minutes only to sharpen a machine, which can thus be always kept in perfect cutting order. It is adjustable to any lawn-mower that is in the market, and needs to be adjusted but once. It cannot get out of order, and is so simple that any one can use it. This appliance is illustrated in Fig. 6. The file carrier, the end of which is seen projecting at the front, is cylindrical in form, and is held in place by a set screw shown at the top. By loosening this screw, the file carrier can be turned until the file is properly adjusted to the angle or bevel of the knife to be sharpened. The file is a three-cornered file, held in place by a set screw at each end. By means of the hook-shaped guide, shown at the bottom of the cut, to the left, and which is adjustable up or down, or may be swivelled either way, it can be adjusted to any of the lawn-mowers that are made. The gauge, which is worked by the large screw, shown to the right, is intended to touch the back of the knife and steady the sharpener. When properly adjusted, it is in such a position that the little macbine may be rapidly moved along the face of each knife, one after another, so as to sharpen their edges with very little trouble.

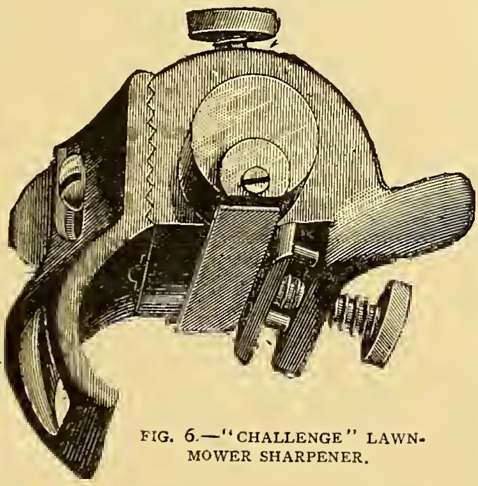


FIG. 6.—"CHALLENGE" LAWN-MOWER SHARPENER.

I received, too late for notice in the June Part, "The Journal of Decorative Art," foı May—an Illustrated Journal for the House Painter and Decorator, and all Art Workmen, published in London, by Mr. Henry Vickers, 317, *Strand, W.C.* Large and beautiful designs for internal decoration, alphabets for painters, printed in colours, and advertisements artistically treated, and also produced in colours, form part of the contents of this handsome trade serial. I have also other articles which I had hoped to notice in this month's Part, but, owing to want of space, I am very reluctantly compelled to reserve my remarks on them for another occasion.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Tool Cupboard.

CHIPS writes:—In the bottom of an old book-case I fixed two rows of small drawers, divided for nails, screws, &c., and in the top a shelf to hold small planes, heads, &c. The insides of the doors are covered with racks for chisels, gimlets, centre-bits, pliers, &c. Other tools, as saws, braces, spokeshave, can be bung on hooks or nails fixed in the body of the cupboard, and the bottom (which is just above the nail-drawers) is available for jack and trying planes, mallet, or any other cumbersome article. The advantage of the above arrangement is that on opening the door every tool is seen at once.

Octopus Glue.

X. Y. Z. writes:—In one of your back numbers you strongly recommended the above. I therefore sent for a bottle, and have used it only twice, and am more than satisfied. The first time on a heavy bloodstone paper-weight three-quarters of an inch thick, broken in two pieces across the middle. It is now as firm as a rock. The second time was on a heavy glass candelabra, with very heavy top; this was clean broken in two in the thinnest part of the stem, but now seems as firm as a rock, and the break cannot be perceived. I cannot say how it would answer for sticking wood, as I have not tried it.

Harmonium Reeds for Sale,

*** In reference to the offer of harmonium reeds made by L. G. L., in "Amateurs in Council," in the May part of this Magazine, page 342, I am now in possession of L. G. L.'s address, which shall be forwarded to any applicant enclosing a *stamped* envelope *addressed to himself*.

Mending Band Saws.

F. S. W. (*Cheltenham*).—Mr. Edwinson will not omit to touch on this in his papers on 'Brazing and Soldering" now appearing. Meanwhile I give you the following method, taken from Spon's "Workshop Receipts," which may be useful to you. [" Procure a piece of charcoal, a blow-pipe, some spelter and borax; file the ends of the saw even, then file the sides so that one side laps over the other; fit the teeth opposite each other, bind it with iron wire to keep in place, moisten the lap of the saw with borax, first dissolved in water, place the saw on the charcoal. The broken parts place by side of a gas jet, sprinkle the parts previously wetted with the spelter, blow the flame of gas until the spelter runs, let it get cool before removal; when quite cold file it flat with the other part of the saw. To set the saw, drop one side on the ground, the other side up, and set on edge of the vice."

Self-Acting Fountain for Aquarium.

T. H. (*Bilston*).—A paper on this subject fully illustrated is in my hands, and will appear very shortly. To an expectant reader the time that elapses between an announcement of this kind and the appearance of the article in question may appear somewhat long, but the illustrations have to be drawn and engraved, and the articles set, proof corrected by author, etc., and then the paper has to run the gauntlet in the way of being "crowded out" for a month or two, an almost inevitable consequence with the number of subjects now in hand, and my earnest endeavour to meet the wishes of readers with regard to their respective hobbies, as far as it is possible and practicable for me to do so.

Violin Making.

MR. J. TAYLOR, writes:—" Will you allow me a word in reply to Mr. Allen's remarks in the current number of AMATEUR WORK, respecting the 'Outline of a Stradivari Violin' which appeared recently? Mr. Allen produces the highest professional opinion that his outline is really that of a 'Stradivari,' but why select an admittedly small (probably an early or experimental) example of the maker. If Mr. Allen has made as many fiddles as I have, he will not need to be told that even so apparently small a difference as $\frac{1}{8}$ or $\frac{3}{16}$ of an inch is capable of having a very considerable effect upon the tone of the instrument. The direction of all Stradivari's efforts was to amplify rather than to restrict his model, and it appears to me therefore preferable to follow his lead in that direction than to go back to the smaller forms of the earlier makers. I am no stickler for hard and fast rules of thumb. On the contrary, I believe that instruments of the violin class of any size, from a kit to a double bass, could be constructed in an equally perfect manner if once the true principles ruling the relations of the parts one to another were formulated. This however has never yet been done, and if Mr. Allen proves himself the man to do it, I for one shall feel exceedingly grateful to him. There is nothing however in the platitudes and errors of his earlier chapters treating of what he chooses to call 'scientific principles' to encourage a hope for so desired a result. One word more. I fail to see the connection between orthography and the dimensions of a violin, and it is certainly not worth my while to discuss the relative wisdom (or folly) of Mr. Allen's 'lucubrations' and my own. I am no novice in the matter, and it may surprise Mr. Allen to hear that he has himself quoted with evident approval, words of mine which were written more than ten years since."

Pulford's Magnetic Paint.

W. L. H. (*Oldham*) is referred to the letter on this subject from Mr. S. Stanton Markham, F.R.I.B.A., District Surveyor of St. George's in the East, in AMATEUR WORK for June (Part XIX. page 400). He cannot have better or stronger testimony than this to the value of the paint. W. L. H. says, in reference to his damp wall, "I do not want to disfigure the wall by daubing on paint. My idea is there ought to be a sort of colourless or transparent paint, which will fill up the pores of the brick, and I shall be pleased to hear of anything of the sort that will be a real cure. I may say that I have applied a patent Silicate Paint internally, but with no benefit." May I in my turn ask W. L. H. what was the Silicate Paint that he applied. Then let me remind him that preparations styled "Silicate" are, as the name implies (Lat. *silex*, flint), intended for external use, and for imparting a hard external coating to brick and stone, similar to that of varnish of wood and paint. There is a preparation for external use manufactured and sold by the Indestructible Paint Compy., which may be procured at 27, *Cannon Street, E.C.*, where specimens of brick and stone, both before and after treatment may be seen. I shall be glad to have the opinion of any reader on this coating who may have used it. I have not, so I cannot speak of it from experience. Unless bricks are the best that are made, I do not think their surface, which is for the most part rough and full of crevices, penetrating more or less deeply into the brick, can be disfigured by painting. The colour of Pulford's Iron Damp Paint for walls is chocolate, not an attractive colour for walls, I am free to admit, but then again the dark paint can be hidden under a third coat (two coats of the Iron Damp Paint should be applied) of any colour that the owner of the house may prefer.

Beehives, etc.

W. B. (*Darlington*). With regard to "articles with drawings on the making of beehives and bee houses which would embrace all the latest improvements," I am ready to receive proposals from any competent writer on the subject. Meanwhile I must refer you to the paper on "A Cheap Bar Frame Hive," by Mr. Alfred Watkins, in Vol. I., page 111. Mr. Earnshaw has sent me another of his papers, which will appear in the August part, I hope. The wants of poor amateurs will never be neglected in this Magazine. I am only a poor amateur myself, and can sympathise with those who are in the same position.

INFORMATION SUPPLIED.

Removal of Ink Stains from Ivory.

G. E. writes in reply to H. A. D. (*Belfast*):—Dissolve one drachm of oxalic acid in a wineglassful of boiling water, moisten the stains with this hot solution, applied with a pad of rag, and absorb the moisture at once with a damp sponge.

Glass Blowing.

G. E. writes in reply to C. J. M. (*Ireland*):—No flux of any kind is required Heat the two ends of the glass rod in the flame of a spirit lamp or that of a Bunsen burner, until the ends are white hot, then press them together, turn the rods around in the flame for a few moments and they will weld together. Anneal the joint by holding it near the flame for a few minutes, then rest it on a piece of wood in a warm place free from draught until the joint is cold. The broken stems of wine glasses may be thus united, and, when carefully heated and joined together a neat job may be performed.

Cheap Lathes.

GRAHAM writes in reply to J. P. (*Staveley*).—Write to the Britannia Manufacturing Co., *Colchester*, describing what you require, and you will get a good article at a moderate price.

Drilling Glass and China.

J. R. (*Manchester*) writes:—J. McC. can get sparks and drills for china and glass riveting from Mr. Coats, 21, *Bootle Street, Manchester*; he supplied me, and I found him reasonable in his charges.

Rapid Heating of Bath.

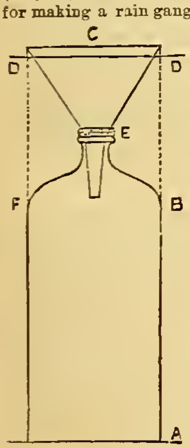
Exon writes:—Alpha will be able to obtain the exact thing he wants by writing to Messrs. Phinsaul Brothers, Ironmongers, *Plymouth*, for their "Rapid Bath Heater," by which you can get a bath of 105 degrees in twenty minutes. The writer has one the cost of which was £6.

Utilization of Sewing Machine Stand.

Graham writes in reply to S. B. (*Dublin*). —A sewing machine stand will answer capitally for mounting a fret saw on. For directions as to construction see page 300 "Every Man His Own Mechanic," a book which if every reader of Amateur Work had and read would save many a query. [To this I may add that a well written and exhaustive article on this subject is now in my hands, with illustrations which are in every way calculated to form a useful and attractive supplement. This paper, which will appear in the September Part, will put S. B. in possession of all the information that he can possible desire or require on the subject.—Ed.]

Meteorological Instruments.

Chemicus, in answer to "T. H. H." (*Ashford*), sends the following instructions for making a rain gauge:—In the annexed figure. A B is a common quart bottle, measuring—from A to B about nine inches. C is a funnel to collect the rain, the top of which must be exactly the same width as the bottle from F to B; C, composition for rendering mouth of bottle round funnel airtight; D, D, ground lines. The funnel must be fixed in the mouth of the bottle, by placing around it at C, some linseed meal made to the consistence of putty. When dry, brown paper must be pasted round it. When all is dry, place in the ground to the depth shown in diagram—the top of the funnel just above the ground. The bottle must be examined every three months, and the number of inches of water carefully measured. The evaporation of water by this plan is reduced to the minimum. In very dry weather the ground around it may be watered.



RAIN-GAUGE.

Brass Wire Spings.

W. B. writes in reply to H. M. H., who asks how brass spring wire is made. The wire is repeatedly drawn through dies of gradually decreasing sizes. It does not, as in ordinary wire drawing, undergo the annealing process after each drawing through the die, but is drawn as stated above; the result being that the metal becomes very hard and spring-like in its properties. In this it differs from cast steel wire, which is tempered in the same manner as tool steel.

J. E. L. (*Oldham*) writes in reply to H. M. H.:—The wire used for spiral and other springs is usually known as "hard-drawn" wire; it is useless for an amateur to endeavour to make it, as it may be obtained from any large wireworks, or no doubt from Mr. Cohen, *Kirkgate, Leeds*, or a dealer in watch and clock materials.

G. E. writes in reply to H. M. H.:—Any tough brass may be made into spring wire by drawing it down from a larger size wire to a smaller and thus rendering it hard. Sheet or bar brass of good tough quality may be hammered hard and thus made into spring brass for flat springs.

Wax Casting and Moulding.

G. E. writes in reply to T. L.:—White wax must be melted in a water bath over a source of heat free from smoke, and in a perfectly clean vessel. Any smoke, or dirt, or over-heating will spoil the delicate tint of the wax. It can be bleached in thin flakes, watered and exposed to the rays of the sun as linen is bleached.

Pipes from Potatoes or Potato Ivory.

G.E. writes in reply to Light-Keeper:—It is a popular error to think of meerschaum as the product of sea-foam, or as Chambers' Journal expresses it *spiuma di mare*. The word is of German extraction, the compound of words signifying in the original, "sea-foam" (*meer-scum*) probably because meerschaum clay bears a similiarity to dried sea foam. Meerschaum clay (silicated magnesian clay) is dug up from alluvial deposits found in Turkey and other parts of Europe, and therefore can have but a very remote connection with the sea. I cannot understand how potatoes can be converted into a substance resembling meerschaum, or into artificial ivory by simply boiling the tubers in dilute sulphuric acid, and I think that some other treatment will be required beside that mentioned in the extract printed on page 353, the effect of which on potato starch would be to make dextrine and sugar. If Light-Keeper means to experiment on the materials mentioned by him, he should know beforehand that sulphuric acid (oil of vitriol) cannot be sent by post, it is in fact a dangerous acid, injurious alike to clothing and skin when spilt upon them. The acid must be mixed with water by pouring the acid carefully into water contained in an earthenware or stoneware vessel, or one of enamelled iron. The mixture must be boiled in an enamelled iron saucepan, the old meat tin would be useless, for it would soon yield to the action of the acid. Water only must be added to make up for loss by evaporation.

Rebronzing Figures.

Mr. Edwinson writes in reply to E. L. J. (*Birmingham*):—Bronze powders of any shade may be bought at oil and colour shops and at tool shops. Paint the figures with gold size, set them aside in a cool place protected from the dust until the size is tacky, then make a ball of cotton wool, dab it in the bronze powder and dab it lightly on the tacky surface of the figure until it has been evenly covered with bronze powder; then put the figure away again, protected from dust until the surface is quite hard. Again make a clean pad of cotton wool and with it brush off all loose particles of bronze powder, then give the whole article a coat of hard clear shellac, varnish and return it to its protected corner until the varnish is quite hard.

Chemicus, in answer to "E. L. J." (*Birmingham*), sends the following bronzing fluid: Fuchsin, 10 parts, aniline purple, 5 parts, methylated spirit, 100 parts. Put in a glue-pot, and apply heat till dissolved. Then add benzoic acid, 5 parts. Then boil the whole for five or ten minutes, until the greenish colour of the mixture has changed to bronze-brown.

Dynamo-Electric Machine.

Mr. Edwinson writes:—Immediately on seeing the complaint of Willing to Help in the part for May, I wrote to Messrs. Patrick & Son for an explanation, and have received the following in reply:

"From Messrs. Patrick & Son, Electricians, 529, *King's Road, Chelsea, London, S.W.*

"*May* 2nd, 1883.

"Dear Sir,—In reply to yours of to-day, we have not to our knowledge in any case omitted to reply to any enquiry enclosing remittance either in stamps or wrapper; indeed, it is only when the enquiry is quite out of our line that we do not reply, even if return postage is not paid. We should therefore think that the mistake occurred in the post, possibly through mis-direction.

"Yours truly, Patrick & Son."

It will be seen that Messrs. Patrick have removed from the address given in page 464, Vol. I., and we may add that it would be to their advantage to advertise their address in our Trades' Directory.

Tool for Cutting Mouldings.

S. J. T. writes in reply to E. W. (*Headley*) that if he will write to, or call on, Mr. Syer, 1, *Finsbury Street, E.C.*, that Mr. Syer will make him the tool that he requires, and explain the working of it to him. [Any of our readers in difficulty about tools, wood, turned work, etc., whether in town or country, may apply to Mr. Syer with the certainty of getting the help they require, if he can give it.—Ed.]

Cutting off Top of Lamp Chimney.

I. O. H. (*Ballymena*) writes in reply to L. B. and C. M. (*Willesden*):—Try a fine hard steel fret-saw, kept wet with camphor dissolved in turpentine, and saw it off.

Cutting Bottom off Glass Bottle.

E. W. (*East Grinstead*) in reply to C.M. (*Willesden*) writes:—Fill the bottle with oil up to the height at which you want it to break. Then gradually dip a rod of iron, heated to redness, into it, when the glass will fly, and the top-piece can be lifted off.

Queen Anne Furniture.

S. J. T. writes in reply to L. W. E. that Mr. Thomas I. Syer, 1, *Finsbury Street, Chiswell Street, E.C.*, will supply him with the small turned railing that he requires.

Design for Small Book-case.

E. Johnston writes in answer to Apprentice Merchant:—This book-case is made entirely of inch-board, and I will begin by naming all the pieces of wood which must be cut out ready to be put together. First, you will want two pieces of exactly the same size, which must be 20 inches long and 8 inches wide; these are for the top and bottom. Then two pieces, 24 inches long and

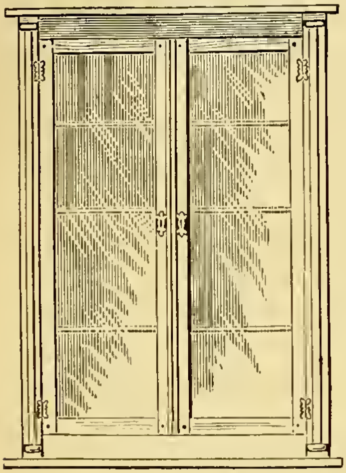


FIG. 1.—ELEVATION OF BOOK-CASE.

6 inches wide, for the sides, and cut a rebate in the back edges of all these four pieces for the reception of back (see Fig. 4). You will want two pieces 24 inches by 2 inches, and two more 18 inches by 2 inches, for the outer frame, four pieces 20 inches by $1\frac{1}{2}$ inches, and four more 7 inches by $1\frac{1}{2}$ inches, for the doors, which fit inside the outer frame. The back need not be made of inch-stuff, half-inch being quite sufficient. This may be made of pieces glued together, and must be 25 inches by 17 inches. Having cut out all these pieces, we will now begin

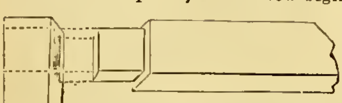


FIG. 2.—METHOD OF JOINING CORNERS OF FRAMES.

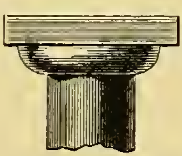


FIG. 3.—HEAD AND FOOT OF PILLAR.

to put them together. First, take your four pieces for the outer frame, and mortise them as shown in Fig. 2, cutting the mortises $\frac{1}{2}$ inch broad and $1\frac{1}{2}$ inches long, leaving $\frac{1}{2}$ inch at the end. You must cut away $\frac{1}{2}$ inch of the tenons to correspond, which will bring the outer edges of the frame perfectly square and level. Then take the top, and nail it on to the sides, taking care to keep the back flush, and allowing it to project 2 inches in the front and 1 inch at the sides. Do the same with the bottom, and the framework of the book-case is made. Now take the large frame that you have made, which, being the same height as the sides, will fit exactly between the top and the bottom, and nail it on to the sides, punching in all the nails, and filling the holes with putty. There are now only the doors remaining to be made. They must be mortised together in the same way as the large frame, and made of the four pieces 20 inches long by $1\frac{1}{2}$ inches, and the four pieces 7 inches by $1\frac{1}{2}$ inches. The mortises will, of course, be smaller in proportion to the thickness of the frame. A similar rebate to that which you have made for the reception of the back must be made in the frames of the doors to receive the glass, which may be fixed in by a small beading. A piece of beading (see Fig. 5) is glued on the right

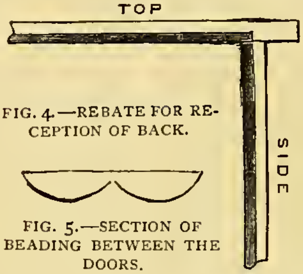


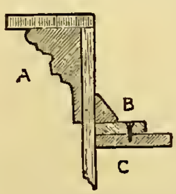
FIG. 4.—REBATE FOR RECEPTION OF BACK.

FIG. 5.—SECTION OF BEADING BETWEEN THE DOORS.

door, which, when the doors are shut, projects over the left door, keeping it closed. Also two little pillars will be required to ornament the side of the frame. Take a piece of wood 1 inch square and 22 inches long, plane it perfectly round, saw it in half, and glue it on, leaving 2 inches at each end for the reception of the head and feet (see Fig. 3), which you must get turned 2 inches square, and when sawn in half should fit exactly. The shelves are put in by nailing or screwing small strips of wood to the sides, on which they rest, or they may be supported by small pegs fitted into holes bored half through the sides. The back must be nailed in before the doors and pillars are put on, so as to make the book-case quite square.

Gilt Cornice.

J. T. F. (*Brixton*) is informed that the special articles he requires for fixing a gilt cornice are called slides and keepers. They can be obtained of Mr. Thomas Syer, 1, *Finsbury Street, E.C.*, or of any cabinet ironmonger. There is another method of fixing which is now more general than the above, namely a second lath similar to the valance board, which lies on the latter and is screwed to it, and is also permanently fixed to the cornice as shown in the figure.



MODE OF FIXING CORNICE.
A, Cornice; B, Fixed Lath; C, Valance Board.

Bronzing Figures.

V. (*Ambleside*) writes in reply to E. L. G. (*Birmingham*):—Dissolve platinum in 1 part nitric acid, 2 parts hydrochloric acid, and evaporate to crystallization; then dissolve the crystals thus formed in water, or, what is better, in spirit of wine or ether; then mix a small quantity of this solution with sienna or crocus—bronzing powder—clean as much of the old bronze off as possible, then gently heat your figures before bronzing, apply the bronze with a moderately hard brush, lighten the projecting parts with a little liquid ammonia, applied with a small piece of chamois leather.

Dissolving India-Rubber.

E. W. (*East Grinstead*) in reply to C. M. (*Willesden*) writes:—To dissolve india-rubber, put small pieces of it in a stoppered bottle, and then add either ether, bisulphide of carbon, naphtha, or chloroform. Keep the stopper loose till the india-rubber is dissolved.

INFORMATION SOUGHT.

Refrigerator and Ice Cream making Machine.

Chips asks:—Can anyone oblige me by giving any hints as to making either of these articles?

Overmantel.

Chips asks:—Will anyone favour me with a good design for an overmantel, with small cupboards, glazed and unglazed?

"Dead" Polish on Wood.

Chips writes:—Can anyone tell me how the dead polish now so much used is managed? I have filled the pores of the wood with American wood filler, and then rubbed it well with linseed oil; this has a fair effect, but not such a good one as I should like.

Cleaning Oil Painting on Copper.

W. J. F. (*Manchester*) writes:—I have an oil painting on copper, which, when it came into my possession, was covered with dirt. I have managed to remove sufficient of the dirt to show that the subject is "St. Anthony Preaching to the Fishes," but although on wetting the colours they come out bright and clear, when the moisture evaporates the film settles over them again. I shall be greatly obliged if you can give directions for thoroughly cleaning the painting.

BRIEF ANSWERS TO MINOR QUERIES.

G. A. A. W. (*North Shields*).—A cheap edition of the book named in your letter will soon be ready. It will be brought out in three volumes, at 1s. per volume. This will meet your wants.

*** Communications from the following writers are held over for reply till next month for various reasons:

A. E. W. (*Keynsham*); H. E. G. (*Headingley*); J. H. (*Clifton*); C. J. L. (*King's College*); Magneto; Graham; A. W. K. (*Bhagalpur*); G. E.; J. E. L. (*Oldham*); Conscientious Turner; Chemicus.

OVERGLAZE PAINTING ON PORCELAIN.

By AURELIO DE VEGA.

V.—APPARATUS: POINTERS—SCRAPERS—RESTS. PROCESSES: MIXING THE COLOUR—STUDY.

71. POINTERS AND SCRAPERS.—The consideration of these need not detain us but a moment. *The Pointers* are shaped as shown in Figs. 30 and 31 (p. 302). They are most generally serviceable when made of soft white wood, and are used for taking out points or patches of light which cannot or need not be left in painting. Sometimes a little spot of one colour is required to be put in the centre of a not very large spot of another—as, for example, the yellow eye of a pink or blue forget-me-not. In this case, the whole space within the outline of the flower is painted with the ground colour, and then the paint is removed with the stick from the spot which is to take the colour of the eye. The circumstances of the moment will decide which shape is best adapted to the attainment of any particular end. Thus, a pointed stick would be used for taking out the light in the eye, while the markings of the trunks of some trees will be better aided by the edged stick (Fig. 31). These wooden tools are used before the paint dries. Sometimes more firmness than they furnish may be required, and for this recourse must be had to a bone pointer. *The Scrapers* will be wanted occasionally to take out lines or points or patches of dried paint, or to remove smudges beyond the outline produced in dabbing or otherwise, if they have been allowed to become hard. These are of steel, and their edge must be sharp and perfectly smooth, so as not to scratch the glaze.

72. The pointers may easily be made by the student. Specially shaped scrapers, as in Fig. 36, presenting a point and a convex edge, are—2 in., 1s. 6d.; 3 in., 1s. 10d. An ordinary shilling penknife will, however, do just as well, if the edge is quite smooth. The blade should be rounded towards the point—not straight—of the kind generally known, I believe, as the pig-sticker shape.

RESTS.

73. These are contrivances designed to assist the painter by giving support to his arm, hand, or finger, and may be movable or fixed. They will not often be required in small work; but in large work, or round work such as vases, a rest of some kind is an absolute necessity, as without such assistance as it furnishes it would be impossible to do the central portions or satisfactorily manage the round. Any attempt to dispense with it in such case would only result in fatigue and in greater or less failure.

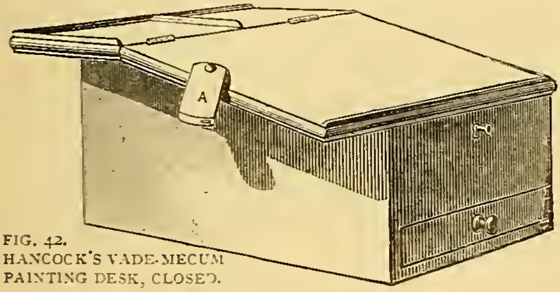


FIG. 42. HANCOCK'S VADE-MECUM PAINTING DESK, CLOSED.

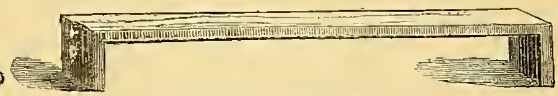


FIG. 40.—HAND-REST.


FIG. 41.—CUTTING FOR HAND-REST.


FIG. 38.—ARM-REST, DROPPED, WITH SCREW SLACKENED OUT.


FIG. 37.—ARM-REST, HORIZONTAL, WITH SCREW TIGHTENED.


FIG. 36.—CURVED SCRAPER.


FIG. 39.—HOLE IN ARM-REST.

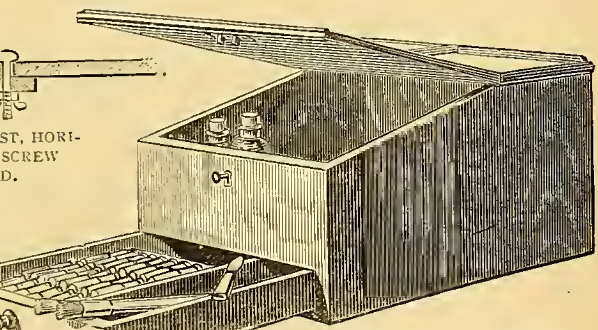


FIG. 43.—HANCOCK'S VADE-MECUM PAINTING DESK, OPEN.

74. *Arm Rest.*—In Fig. 29 (p. 300) was shown the spot (G) in the painting table at or near which, according to the convenience of the painter, the movable arm rest would be placed. The rest itself consists of a plain piece of wood about 6 in. wide, $\frac{3}{4}$ in. thick, and from 18 to 24 in. long. This rest may be made of any material, but, from the strain on it, preferably of mahogany or oak. For my part, I think it an advantage that it should not be French polished—simply

planed smooth, and rubbed with a little linseed oil to darken it. It is then less slippery. The attachment to the table is by means of a long bolt, with a head at one (the top) end, and at the other a screw on which a butterfly-nut works. This bolt must be long enough to go through the rest, the table, and the nut, and then project about an inch below the nut. The object of this excess is to allow of the nut being screwed out, when, of course, the end of the rest which is on the table being less confined, the outer end will drop in consequence of the weight of the arm on it. This drop is often of the greatest convenience and relief to the painter. The hole in the table need only be large enough to take the bolt. That, however, in the rest, must be considerably larger, or, at any rate, longer than it is wide, to allow of the drop.

75. *The Arm Rest is used thus:* The painter, being seated at the table, has the rest on his right hand. Then, having his plate, or tile, or vase in his left hand, and resting on his knee, he places his right forearm on the rest, where it is completely steadied, and he is at perfect liberty to direct his hand without having to support the weight of his arm. The rest being on a pivot, he can move it at will, and thus work most easily on any part of the piece, which may be of any size. By means of this rest stooping is entirely done away with. In Figs. 37 and 38, two sectional views of this rest are given. In the first it is shown fixed tight; in the other, slackened down. In Fig. 39 is shown the shape of the hole in the rest.

76. *Hand Rest.*—This rest, which is most simple and inexpensive to make, is represented in Fig. 40, and has this further in its favour, that a hole need not be made in the table. It consists of a middle upper piece some 18 in. long and 3 in. wide, with ends which give a clear height of 2 in. from the table. It may be cut out of any piece of wood, as shown in Fig. 41, and the two ends glued and nailed to the long piece. The arrangement is thus a bridge, which crosses the ware, and the hand rests on it immediately above the piece. The only disadvantage is, that as the rest must lie on the table, the use of it necessitates a more or less stooping attitude. To buy, the price is about 2s., in mahogany.

77. *Finger Rest.*—This is sometimes used. It is a small slip of thin wood, a few inches long, which is screwed to the upper part of the inner edge of the arm rest, and, as its name indicates, serves as a rest for the finger in large work. It moves easily on the screw as its pivot, and, when not required, may be turned round on to the arm rest, where, being thin, it in no way interferes. It is shown, at A, as part of the desk in Fig. 42.

78. *Painting Desk.*—An arrangement which combines the advantage of the arm rest with the absence of necessity for a special table through which a hole for such rest must be pierced, is shown in the desk of which two views are given in Figs. 42 and 43. With this desk (which is Mr. Hancock's design) any suitable room may at once be converted into a study. Its interior is sufficiently capacious to hold all the apparatus and working appliances required, and has proper receptacles for the mediums; while below is a drawer which takes the colours and brushes. The upper part is a flat ledge, which takes the palette, etc., during work. The lid forms a slope, on which flat ware may rest; and on the left it projects 4 in., the projection forming an arm rest, on the edge of which is the finger rest. Altogether, it is a most convenient arrangement, and with it there can be no possible excuse for dust or dirt, as the work in hand may find a place inside as well as unconsumed prepared colour. The desk, which will stand on any table, is made of walnut wood, and its price, empty, is 20s. Fitted, the price varies with the selection of the colours and the size of the bottles, and the stock and quality of the brushes, mediums, knives, etc., ete. The dimensions are—full height, 7½ in.; length, 14 in.; width, 8 in.; width of lid, 12 in.; and the whole has a lock and key.

PROCESSES: PREPARING COLOUR.

79. In the last paper we saw how to produce our design on the ware as a preliminary to the laying on of colour, for as soon as the colour is mixed it should be used. It will not do to mix the colour first and draw afterwards; the outlining must precede the painting, or whilst it is progressing the colour will be deteriorating, unless the painter is also a skilled draughtsman.

80. Having, then, produced our design on the ware, we proceed to mix the colour with the mediums. As to the proportion of the latter to be employed, a precise rule cannot be laid down. Different pigments require different proportions of medium, and the same pigment requires varying proportions, according to the end sought. It may be said generally that the ordinary blues, rose, and purple take most "fat," and the yellows the least. More fat, again, is required when it is desired to lay the colour flat, as in backgrounds, either with the brush, or when the use of the dabber—a process to be presently considered—is contemplated; or to have the colour flow to a very slight, perhaps only just appreciable extent, as in delicate shading; or to lay a very thin tint. Practice and observation will alone enable the student to instantly perceive when the colour is properly mixed for the special work in hand. At the same time he will find the following general instructions of the greatest help in forming a judgment. There is more failure among

beginners from want of rightly estimating the exact quantity of oil to be used than from any other cause, and therefore I cannot too strongly urge the strictest observance of my indications in this respect, which are more detailed and complete than any I have seen given by other writers on the subject.

81. *General Rule for Oil and Spirit.*—(*a.*) *Powder Colour.*—In mixing powder colour, the orthodox direction is to lay a little powder on the slab, and add to it just so much oil as will make it into a thick paste, to be subsequently reduced to the requisite thinness by spirit. A good illustration of the relative consistence of the paste and the prepared paint is furnished by cocoa, which, as bought prepared with milk in tins, is such a thick paste, and should be diluted to a cream before the boiling milk is poured on it. For my part, however, I have found that a mixture of oil and spirit—say two parts of the former and one of the latter—is better than oil alone; as it takes a quicker and better hold of the powder, there is less liability to make the colour over-fat, and the colour is ground more readily and satisfactorily. Thus there is a saving of time, and very often, too, of powder; for, if the colour be made too fat, the evil can only be remedied by the admixture of more dry powder, which may mean much avoidable waste. Whether, however, pure or diluted oil is used, it may be laid down as a general rule for ordinary work that, in the grinding, the colour must be sufficient in quantity to exhaust the moistening capacity of the medium. The grinding will be done on the slab with the muller. There will be a tendency for paint to collect on the edge of the muller. This paint must be set in to the centre of the muller again, so as to ensure all being equally ground. This should be done with the proper palette knife, and not with the brush, as if the latter is used it will take up particles of colour, which will show a different depth of tint in the work, and give a spotty appearance. When the colour has been ground with oil and spirit to a cream on the slab—in which state we may call it *prepared* colour—it should be transferred with the knife to the wells, and from them it will be removed to the slants as wanted, where it will be diluted to whatever extent the requirements of the painting demand.

(*b.*) *Moist Oil Colour.*—Those who may adopt moist oil colour, in tubes, will find that the colour, when fresh, contains exactly the right quantity of oil. The colour is, in fact, in the paste stage, and only requires to be diluted. When, however, the tube gets old, the oil very often separates from the pigment, and either collects in one part or oozes out, leaving the pigment a hard mass. This is the worst of many of the French colours; but in Hancock's moist oil colours the evil, such as exists, is minimized by their being prepared with his keramic medium. If tube oil colour dries, it must be entirely re-ground.

(*c.*) *Moist Water Colour.*—This requires no grinding or other preparation, simply dilution with water, although some may derive a little help from the addition of a touch of china megilp. This megilp plays in the water colour a part corresponding to that of the oil in the powder colour, and the water colour may be likened to the tube oil colour for consistence, with this difference in use—that further addition of megilp may be entirely dispensed with. I may be excused for noticing here again a point as to which I have already commented, viz., the necessity of cleanliness. Oil colour can and may, without showing, be laid on a surface not as clean as it might be, and it may be sent on to the kiln, and *then show up the stain*; but with water colour it is a *sine quâ non* as regards success in laying, that the ware should be scrupulously clean. To such a surface, however, it takes very kindly, even in the thinnest washes. Further, the outline *must* be in Indian Ink. The chalk, being greasy, would grease the brush, and the water colour, instead of lying flat, would ridge and spot.

82. *Tests for Proper Mixing.*—If the colour has been properly mixed, it may be laid quite evenly with very little practice. The very first difficulty which the student will experience in his endeavour to lay the paint arises from the nature of the surface, which, being glassy and perfectly polished, affords no *tooth* for the brush, being, in this respect, totally unlike either paper or prepared canvas. The water colourist will miss one of his leading aids. There is, with oil paint, no washing in a tint in the same sense as on paper. If prepared colour were diluted with oil sufficiently to be *flooded on* to the tile, it would not produce a uniform tint, unless one too light to be generally serviceable; and if spirit were the major diluent, the individual grains of pigment would separate, and the surface would be speckled, and present the appearance of common maps coloured by printing in dots We will therefore notice one or two tests.

(*a.*) *During Work.*—A trial of the mixed colour should be made with a moderate sized brush on the edge of the piece in hand, or better, because more cleanly, on some slip of ware. One cannot too frequently test the freedom of working of the mixed colour. If the brush glides easily—yet so far from slipping as to appreciably hold the ware—giving a smooth, fine, unbroken line, or, when pressed, an even and regular band, the colour, as a basis, contains the right proportion of medium. If the colour cannot be laid evenly, but makes heavy ridges at each side of the brush mark, leaving only a faint tint in the middle, and other strokes on the ridges only continue the appearance, too much oil has been used, and the

remedy is the addition of fresh dry colour. If the grains of pigment become separately discernible after adding spirit, it is a sign too much spirit has been added, and this excess is further indicated if a touch of the brush on the ware results in a ring with the colour tending towards the edge, or if again the laid colour dries flat and almost immediately. If a brush overladen with spirit touches still wet work, such work will be more or less spoiled by the spread of the spirit, which will expend its energy among the surrounding colour, and quite destroy its "lay." If such an accident should occur in a graduated tint, the probability is that the whole tint would have to be taken out and relaid.

(*b.*) *After Firing.*—The foregoing tests show themselves while the work is in progress. There are others which appear after the work has been through the muffle. It is not surprising to find it assumed in some books on this subject that the work has been successful, and gone bravely through its fiery ordeal. Such a result is, of course, gratifying to all concerned, but it is not always forthcoming; and the object of these papers, which is the presentation of a sufficient guide in all that is essential, would not be attained if I omitted to notice here the defects in the fired work, so far as they may be produced by bad mixing of the colour. These are two. If the painting has gone to the kiln with too much oil in it, it is certain that the colour will blister. This result I have described in Section 32, p. 234. If it comes back with a dry powdery look, with the colour scarcely adhering enough to keep itself from being rubbed off, it shows that, in working, the colour has been over diluted with turpentine, though not to the extent of the grains separating. This will, probably, be the result if the ware has been sent to the kiln *dry*, as described in the last paragraph. These considerations furnish the proof of the reason for the former requirement, that for a thin tint the diluent must have a larger proportion of oil than of spirit. The remedy for the dryness is simply repainting, using a little more oil with the colour, and a very little enamel glazing. The remedy for the blistering is simple, but tedious, and in practice would only be adopted if the painting were worth the trouble. Still, even if a rough piece of work has blistered, I am inclined to think that it is worth while trying the remedy on it once just for practice. It consists in chipping off the blisters, and then rubbing down the irregularities. The chipping may be done with an old knife until a fairly smooth surface is obtained, and then with a piece of pumice stone the final smoothness is given. Of course, as the boiling up has given the work a pitted appearance, this rubbing down, if the coat of paint has been thick, may not produce a *perfectly level* surface, but it must remove all roughness and jaggedness. The part which had been spoiled is then repainted to match, care being taken, if a quite flat tint is wanted, to make up for any irregularities of depth of tint produced by the rubbing by lighter or heavier touches as needful.

83. *Subsidence of Pigment.*—In the case of many mixtures of colours, there is a tendency for a heavier constituent to precipitate. This must be met by occasional stirring up with the palette knife or a bone pointer, *not* with the brush.

84. *Surplus Colour.*—(*a.*) *Oil.*—If more colour has been mixed than can be used on the day, it may keep good till next day if well covered up with a plate of plain glass over the wells. More likely, however, it will be a trifle flat, and, of course, more dry colour must, in such a case, be added. Colour that has been prepared with tar oil and spirit will suffer less in this respect than any mixed with oil and spirit of turpentine; while least inconvenience of all will be experienced with the use of the keramic medium. All prepared oil colour should be consumed within the second day. It is not worth doctoring after that. In this connection the use of essential oils, such as lavender, as mentioned in Section 32 (*c.*) will be borne in mind.

(*b.*) *Water.*—In the case of the water colours, there need not be the slightest waste. All that is taken from the tubes or pans can be used at any time, as this kind keeps in working condition, not for days, but for months, and if it hardens by keeping it will immediately become workable again with pure water, with or without megilp. Very little practice will show how much colour will be necessary to express from the tubes for any given object, but what is taken from them cannot be replaced. What has been taken from the pans, however, can and may be put back again, *provided* it has not been touched by any other colour.

MONOCHROME STUDY.

85. Having got thus far, we are in a position to do something by way of actual work, and, accordingly, I give with this a simple study of flowers and leaves —a couple of lily of the valley leaves, with their flowers, a few sprigs of forget-me-not, and a leaf and flower of fancy pelargonium (pink and black). There is no background in this initial study. It is in outline, so that it may be readily transferred.

86. *Preparation.*—The picture will look best on an 8-inch tile if reproduced actual size, but may be reduced to fit a 6-inch one. Outline in one of the ways already described, taking care that the outline for water colour must be Indian ink on *un*prepared ware.

Having done this, mix colour. A monochrome is professedly a painting in one colour, but not all colours shade themselves. Strictly, indeed, not any colour shades itself; but in china painting it is

customary with some colours to often denote shadows, simply by increased depth of tint. In monochrome, this may be carried to a greater extent than is permissible even in colour work. Some of the prettiest Dresden work is in monochrome rose, on a canary yellow ground. Still, there are many colours which

FIG. 44.—MONOCHROME STUDY FOR CHINA PAINTING—LILIES OF THE VALLEY, FORGET-ME-NOT, AND PELARGONIUM.

may be shaded with allied colours, and when this can readily be done so as to obviate the necessity for a second firing, it should. Indeed, all monochrome may be finished in the one painting. For our present purpose, take red. It is the colour with which beginners are usually set to work, and is of all perhaps the best adapted for the purpose. It flows readily, and works most smoothly. At first, I would recommend that the subject be done in red alone, merely deepening the tint for the shadows. It will be advisable to make four degrees of depth at first—a very pale shade, a medium shade, a deeper shade, and a full shade. Subsequently, the student will find that he can do with mixing fewer shades, as he acquires facility in graduating his tints on his slants, and appreciating their fulness. If success attends the effort in red, then employ also Brunswick and chocolate browns for middle and deep shadows, using pale tints of red for the lighter portions, and a medium tint for the next depths. The full tint of red will not be required in this mixed scheme, while the tints of the two browns will be from medium to fulness, and light tints of

them will be out of place. A very trifling amount of consideration also will show when a slight mixture of red and Brunswick, and Brunswick and chocolate, will be advisable, and this will give good instruction also as to the tints which arise from mixture between any two of the three colours which are all of the same character, and therefore may be safely mixed.

For the size of the copy a No. 6 or 7 brush will be a very good size for the lily leaves and the pelargonium leaf. A size smaller for the petals of the central flower, and for the myosotis and lily flower, say No. 2 or 3, which will also do for the stalks. For the leaves I should say a flat brush.

87. *Painting.*—(*a.*) *The Leaves.*—The present study affords some noticeable points in china painting. The lily leaves will be done with full strokes of the brush, well filled. The strokes should be taken from point to stem, observing the central line and the curve of the edges. In this case, the lines of the leaf are to be left by the brush marks, so there is no process to be observed for producing a flat tint, which would be absurd. The flowers will be painted over. If the outline has been properly done and dried, it will not rub up in the painting, and will show through sufficiently. In doing the pelargonium leaf, no care need be taken to keep within the crenated edge or the part touching the flower. Paint freely, and before the paint is dry, remove what lies beyond the edge with a piece of rag, which may or may not be damped with spirit of turpentine. This removal must be effected from the edge outwards, and not along the edge, as this would leave a fine line of deeper tint, which would give the edge a hard look. In this leaf there are light veins. These may be made out in two ways. First, the leaf may have a light coat first, then, with a stick point, take off the paint right down to the ware, which shows up its glaze, and then, when this first coat is dry, go over the whole again with the tint or tints proper to give the required depths, covering the lines first taken out. This process gives a very soft appearance to the veins. Second, the veins may be gone over with a fine brush just *damped*, not wet, with spirit. This lightens the first-laid coat exactly on the lines of the veins, but it requires more care than the other way. The forget-me-not leaves are simple, and take the plain brush stroke.

(*b.*) *The Flowers.*—Those of the lily and of the forget-me-not over the leaves are to be taken out. This may be done with a rag while the paint is moist, or with a scraper after it has dried. The former operation is the easier; with the latter a somewhat finer result may be obtained. The lights of the lily flowers will be the white glaze of the ware unpainted. In painting the shadows on these flowers, a little extra fat will be advisable, and the shadows must be very, very delicate and well-toned. The greatest care must be taken so to tone as to preserve the roundness of the flower. The pelargonium petals have a decided tint which, on the plain ones, covers only half the petal—the half next the edge. The remainder is very faint, and faintest next the throat. This effect may easily be produced thus—paint the well-toned half, then with a dry brush carry the colouring from the inner edge of that half down to the centre. The colour must be a little oily for this, and a dry brush will spread enough colour. Note that the veining of this lighter half is extremely delicate, and of a very slightly deeper tint. For this use a fine pencil. The forget-me-not petals will have, for the most part, flattish tints, and only require a little careful, delicate treatment. Do not overload the brush with colour—better let the work be a trifle under- than over-painted, for the former can be remedied, the latter cannot. If too much colour has been used it may easily be removed with rag, but care must be taken to do this gently, so as not to raise the outline.

88. This finishes our little subject for the present. The study will not have offered much difficulty to a generally "handy" hand, while it has served to give an insight into some half-dozen manipulations peculiar to china painting. The tile, when dry, may be sent to be fired, and if the foregoing directions have been successfully followed, the painting will return ready to be framed.

(*To be continued.*)

BOOKBINDING FOR AMATEURS.

By the Author of "The Art of Bookbinding."

VI.—FINISHING.

THIS branch of bookbinding the amateur will find most difficult, and, as a rule, is the one the amateur fails in. There are certain conditions the amateur must strictly observe before it can be said that he is able to finish a book in the simplest form, or, in other words, that he is able to work a tool on leather so that the gold adheres without burning the leather. The chief condition is the knowledge of the various degrees of heat required for the various colours and leather. But of this further on. The materials required are :—

The *gold cushion*, *knife*, and *gold*, as spoken of in edge gilding.

Various size Type.—The type used in binders' shops are those made from brass; but the amateur will find those made from lead (printers' type) quite suitable, but great care must be exercised lest the

type melt when placed on the gas stove; this naturally cannot happen with brass type.

Type-holder.—The holder, or *type-case*, best adapted for the amateur is one with a screw at side and end so as to admit of the various-sized type being used (Fig. 33). Price from 7s. 6d.

Gas Stove.—A gas stove of some sort is now to be found in almost every house. Any one of these may be utilized, providing that the flame from the gas plays enough upon the tools to impart the necessary heat. The circular stoves with a rim round them are the best (Fig. 34), and should it be necessary for the amateur to buy one, it can be purchased from any gas-fitter's shop. A small gas stove the amateur will find very handy; with it he can warm his glue, make his paste, heat his tools for finishing, besides for many other convenient uses. Where gas is not obtainable, charcoal may be used. A large old tin can may be utilized by making some large holes through the sides; it will keep alight for hours, and impart quite enough heat for any purpose required. This primitive stove must be placed on a stand or thick iron lest it become dangerous.

Pallets, ornamental and plain, used for the backs. Two or three of each will be enough. (Fig. 35.)

Centre and corner tools.

Rolls are circular discs mounted on a carrier, with ornamental designs engraved upon the edge; they are used on the sides of books. (Fig. 36.) The amateur should have a small pattern one to run round the edge of the paper or cloth sides, and as he progresses others for more ornamental and full-bound work. The method of using the roll is shown in Fig. 32.

Fillets are the same as rolls, but with lines instead of ornamental designs.

The *Polishing Iron*, to polish the leather when glaired, is shown in Fig. 37.

Glaire may be purchased, or may be made from the white of egg, which must be very carefully beaten up to a froth with an egg-whisk. In breaking the egg, care must be taken not to let any of the yolk get amongst the white. A little vinegar should be mixed with the white before beating up, and a grain or two of table-salt, or a small piece of camphor, or a drop of ammonia will in some measure prevent it from turning putrid, as it is liable to do. When well beaten, allow it to stand for some hours, and then pour the clear liquid into a bottle for use.

Cotton wool, for taking the gold-leaf up and pressing it firmly on the leather.

A gold rag, to wipe off the surplus gold from the back or sides of a book. It should be prepared by having some oil well worked into it, so that when it has been wiped over the back or sides the surplus of gold may adhere and remain in it. This rag, when full of gold, will be a dirty yellow colour, and may then be melted down by any of the gold refiners at a small cost, and the gold recovered.

Sponges, large and small: the large ones for paste washing, the smaller for glairing and sizing.

Varnish may be purchased at all prices; use only the best, and be very sparing with it. Zaehnsdorf, 36, *Catherine Street*, *Strand*, has the name for selling the best varnish, and a small bottle, costing 1s. 6d., will last a very long time. Varnish should only be used on that part where glaire has been applied, and has afterwards been polished with the iron, the object being to keep the brilliancy and to preserve the leather from the ravages of flies and other insects, which are attracted by the glaire; these pests do great damage to the covers of books which have been prepared with glaire, by their eating it off.

A small pair of spring dividers, some lard, and some sweet oil, may also be mentioned.

Finishing may be divided into two classes—*blind* and *gold*. As a rule, the tools used for blind work are very bold and solid, those for gold are cut much finer and are well shaded; some tools, however, work equally as well for the one as for the other.

To *blind* work, or as it is also called, *antique*. For calf, morocco, and russia, first make an impression of the tool on the leather as a guide, with the tool slightly warmed, now make the leather damp; the tool made warmer is again impressed exactly on the same spot; this is repeated a number of times, thus singeing or burning as it were the *surface only*, until it has assumed its proper degree of colour, which is a dark brown.

It must be understood that to finish the back of a book, the book must be held in the press at the fore-edge. A small press is used in the trade called a finishing press, but this is not for the amateur to have. The amateur will find the pallets most difficult to use, or rather to work straight. Should he have much trouble, by placing a strip of thick paper or vellum across the back and running the sharp edge of a folding-stick alongside, a straight mark will be made, this mark to be used as a guide for the pallet. In using a pallet, hold it firmly in the right hand, and let the working motion proceed from the wrist only, as if it were a pivot. A little practice is all that is needed.

Should the tools have any tendency to stick to the leather, rub them over a piece of rag or leather upon which has been rubbed some lard; the grease will make the tools slip, or rather come away and prevent them burning. Should a roll be used for any flat surface, such as a side, and should the roll have a running or continuous pattern, a mark should be made upon the side with a file, at the exact point that first comes in contact with the leather, so that the same flower or

scroll may always come in the same place in the repeated working. It is impossible for a roll to be cut so exactly that it may be worked from any point in the circumference without doubling it. Another method of working blind, or rather, in this case, black lines and impressions, is first to work the tool or lines, then holding the tool over a gas-flame to smoke it, it is reworked on the leather, leaving a black impression. The leather in this method must be dry, and the smoked

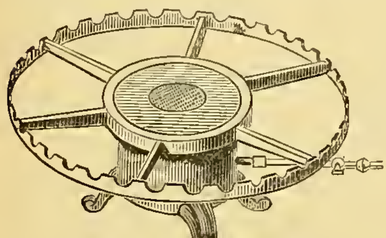


FIG. 34.—GAS-STOVE FOR TABLE.

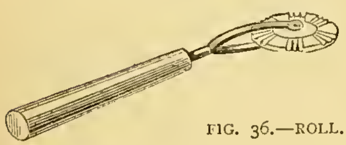


FIG. 36.—ROLL.

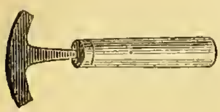


FIG. 35.—PALLET.

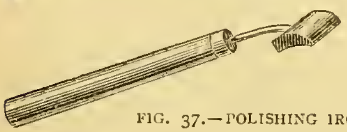


FIG. 37.—POLISHING IRON.

impression must be varnished. When the whole has been worked the back is ready for lettering.

Gold work is far more complicated than blind work, so it will be better if my reader practises upon some pieces of roan, calf, and morocco before he attempts to finish a book. Suppose a half morocco book is before us to be neatly finished and lettered: take a broad and narrow, or two line pallet of a suitable and proper size, work it against the bands in blind as a guide for finishing in gold. As the impression need be but very slight, warm the pallet on the gas-stove but

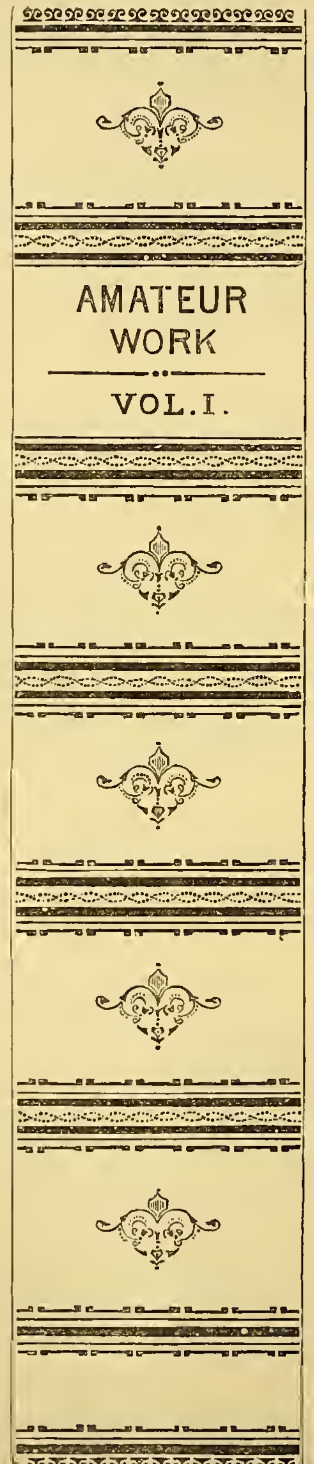


FIG. 38.—EXAMPLE OF FINISHING ON BACK OF BOOK.

very little. Choose some suitable tool as a centre piece to go between the bands; work this also lightly on the back, exactly in the centre of each panel, except the one for the lettering. Now wash the back with vinegar and water, and brush it well with a hard brush to disperse the moisture and drive it equally into the leather.

The impressions made by the pallet and tool are now to be pencilled in with glaire; when dry, pencil in another coat; allow this again to dry,

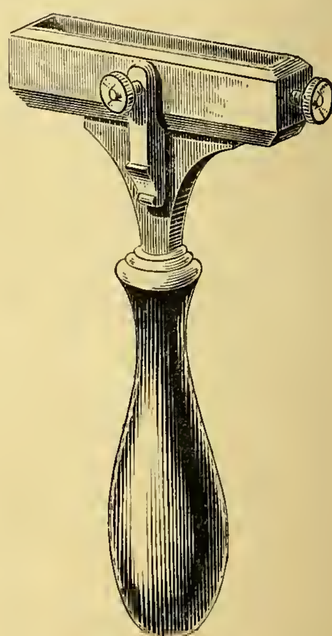


FIG. 33.—TYPE-HOLDER USED BY FINISHERS IN BINDING.

then rub them very slightly with a piece of oiled cotton wool. Take a leaf of gold from the book, and spread it out evenly on the gold cushion; cut it as nearly to the various shapes of the tools as possible. Now take a large pad of cotton wool, grease it by drawing it over the head or down the side of the face, press it slightly on the cut gold, the piece will adhere to it, and transfer the gold to the impressions made, care being taken that the whole of the impress is covered and that the gold be not broken, for economy's sake; should it be necessary to put on another piece of gold, gently

breathing on the first will make the second adhere. When all the impressions are covered with gold leaf, take one of the tools, heated to such a degree that, when a drop of water is applied, *it does not hiss, but dries instantly*; work it exactly in the blind impressions: the overplus of gold may be taken away by passing the gold rag over the impressions; should there be any parts where the gold does not adhere, they must be re-glaired, and worked in again.

FIG. 39.—TOOL SUITABLE FOR BLIND WORK ONLY.

FIG. 40.—TOOL SUITABLE FOR BLIND AND GOLD WORK.

This is really the whole method of working on morocco, and when this simple finishing can be executed properly and with ease, the more difficult task of finishing a full gilt back may be attempted. It is not always necessary that the finishing be done in blind first; one who is accustomed to finishing finds that a few lines marked previously with a folding-stick as a guide is all that is required; but the amateur had better work the tools in blinds, as it affords practice.

FIG. 32.—FINISHER AT WORK.

Calf work is somewhat different to morocco; being porous, it requires a ground or foundation for the glaire. Calf has generally a morocco lettering piece of a different colour to the calf for the title; some object to lettering pieces, saying they are liable to peel off, and so they will unless properly pasted on; but a better effect is produced in a bookcase when a good assortment of coloured lettering pieces are placed on the variously coloured backs. For lettering pieces take morocco of any colour, according to fancy, and having wetted it to facilitate the work, pare it down as thin and as evenly as possible. Cut it to size of the panel or space it is intended to fit; when cut truly, pare the edge all round, paste it well, put it on the place and rub well down, placing a piece of paper over it to prevent the folder marking it when rubbing. Care must be taken that the piecing leather does not project over the joints. When dry, marks may be made on the back with a folding-stick, as a guide for pallets and other tools. Now paste the whole of the back with the paste brush, and with a thick folding stick, or handle of an old tooth-brush, rub the paste into the leather; before it has time to dry, take the overplus off with a sponge dipped in thin paste water. Much depends upon the groundwork being properly applied, and, above all things, remember to have everything clean—paste water, size, glaire, sponges, etc. When the paste water ground is perfectly dry, say in about one hour's time, take some *Young's patent size*, bought at any oil-shop (one pennyworth will last some time), melt it in a pipkin with a little water, and apply it with a very soft sponge, very evenly, over the back. When dry, give two coats of glaire, the first must be dry before the second is applied, and great care must be taken that the sponge does not go over the same place twice while damp, or the first coat will be taken away; when quite dry it will be ready for finishing. Cut the gold to the proper size, take it up on a cotton pad, and lay it carefully down on the spot it is intended to gild; if a full gilt back, all over.

FIG. 41.—TOOLS, CORNERS AND CENTRE, SUITABLE FOR GOLD WORK ONLY.

A little lard rubbed over the back with a piece of cotton wool, will cause the gold to adhere. Should there be any place where the gold is broken,

lay a small piece of gold leaf over it, breathe on the first gold, and press gently on it. Now work the various tools chosen on the back, the heat to be that the tools hiss when placed in the cooling pan. When the backs are finished, rub the gold off with gold rag, and clear off any residue of the surplus gold with india-rubber.

Lettering.—Set up the proper title in a type-case of a type sufficiently large and suitable to the book; the chief word of the title should be in somewhat larger size than the rest, the others diminishing, so that a pleasant arrangement of form be attained. In order to adjust the length of the words, it may be necessary to space some of them—that is, to put between each letter a small piece of metal called a space. Make the face of the type perfectly level by pressing the face of them against a flat surface before tightening the screw; they must be exactly level one with another, or in working some of them will be invisible. If the book is half-morocco, work the letters in blind first as a guide, damp the whole lettering space with vinegar; when dry, pencil in the impression twice with glaire, and work them in gold. Should the book be in calf binding, lines are made across the back by placing a thread of fine silk across the back. The lettering is worked against this line; of course the centre of the back must be also marked, and the centre letter against the mark. When the back is finished, it may be polished with the polishing-iron, which must be perfectly clean and bright before it is used. Prepare a board from an old calf binding, by rubbing some fine emery and lard over the leather side; by rubbing the iron over this prepared surface it will acquire a bright polish. Warm the iron a little more than the tools; that is, the iron should hiss briskly when placed against the cooling sponge; if too hot, the glaire on the back will turn white, if too cold the polish will be dull. To use the iron, hold it lightly, and give it an oblong circular motion over every portion of the back, the grease upon the leather will be quite sufficient to make the polisher glide easily over the surface.

The whole may now be varnished by means of a small pad of cotton wool.

A blind or gold roll worked against the edge of the cloth or paper side, a slight press with tins between boards and book, and our book may be said to be done.

I have not entered too deeply into the art of bookbinding, but sufficiently to enable my readers to bind successfully their own books. Should difficulty arise at any point, I shall be pleased to put them in the right way, and at some future time send to our editor a paper on other matters pertaining to bookbinding.

RUSTIC CARPENTRY.

By ARTHUR YORKE.

IV.—PORCHES, ARCHES, AND STEP STILES.

RUSTIC PORCHES.—Few things add more either to the appearance or comfort of a cottage or small house than a porch; I shall, therefore, begin this article with suggestions for constructing one.

In the design given in Fig. 18, the material still supposed to be employed is larch, or some other wood of the fir kind. The reader who has gone through the directions for building summer-houses, will readily understand from the illustration the method of construction. A few points only will require explanation.

The two posts against the wall should be made of half stuff, which will fit more readily to the masonwork than whole poles, and will be more securely nailed to the joints of the wall.

It should, however, be observed that nailing into the mortar joints of masonry merely, is at all times a slovenly and insecure way of fastening woodwork to a wall. The more workmanlike method is to make a hole with drill or chisel, and to drive in a wooden plug to which to nail. Elm makes the best plugs for this purpose. It holds the nails most tightly, and is least liable to split. But this by the way.

Of the sides, I have shown the lower portion filled with closely-fitted woodwork, and the upper portion left almost open. The lower part is, of course, most exposed, and requires shelter most; the upper being to a great extent protected by the eaves. But if—as in some situations it may be—it is an object to shelter the doorway as much as possible, the design may be varied by carrying the close woodwork to the top. This, however, will have rather a heavy look, and a middle course might be better. In Fig. 19 is a design for the side of a porch, in which the upper part is, to a great extent, filled with lattice-work of rough bangles. This, if covered with creepers, will, without looking heavy, give as much shelter as can often be required.

Surrounding the pediment in Fig. 18 I have shown a cornice of fir cones, fixed with brads to the pieces of half-stuff, which hide the rafters and boarding of the roof. When fir cones come in the way, the worker will always do well to take care of them. They may often be used with good effect in combination with rustic-work.

It is not always easy to find a satisfactory means of roofing a rustic porch. In a former place I have spoken of thatch as the only covering which goes really well with rustic-work. If the cottage to which the porch is added be a thatched one, the question is, of course, at once answered; but in very few instances, at the present day, is this likely to be the

case. If the house be slated or tiled, a thatched porch would look incongruous. Slates are, and always must be, the reverse of ornamental; and, besides, both slates and tiles will, to the amateur, present difficulties in the fixing. Metal, such as zinc or galvanized iron, makes for practical purposes a reasonably good roof, and may be quickly and easily fixed by anyone; but metal roofing is far from decorative. When compelled by circumstances to use such a roof, I have got over the difficulty by making a trellis of small wood to rest an inch or two above it, and as the house was covered with vine, the growth of a single season enabled both zinc and wood-work to be completely hidden; and to make the porch appear on the outside to have no covering but one of greenery.

This green covering to the metal had a further advantage. Sheet metal grows disagreeably hot in sunshine: the living canopy shaded and kept it cool; and this was not only advantageous to those who might sit under it, but also to the roof itself. Sheet metal, and more particularly zinc, has a tendency to warp and twist when much heated by the sun; and by shading it, this evil was to some extent obviated.

In the illustration I have indicated tiles as the roofing used, and indeed, in most cases, they are to be preferred wherever thatch is inadmissible. They can be had to match in colour with a slated roof, and, at the same time, of ornamental shapes. There need be no great difficulty as regards fixing them, if the arrangement used in the design before us is adopted. The rafters are of half-stuff, with their sawn sides upwards, and on these is nailed a level course of three-quarter inch deal boards. The boards are better if cut in narrow strips, as they are then less liable to warp. On the boards the tiles can be nailed by anyone—the operation is much more simple than that of fixing them on laths.

Wooden shingles of, say, 10 by 4 inches, will also make a suitable roof for our purpose; and whether shingles, tiles, or metal are used, I advise that the flat-boarding as a foundation be resorted to. Its edge can be concealed by a strip of half-stuff. Within, it can be lined and hidden with mosaic or bark, for which it will form a good ground.

Garden Arches are rarely built, except as supports for climbing plants; and as they are intended to be covered and hidden as soon as possible, much elaborate design or workmanship would be thrown away upon them. All that is required is that they should be generally pleasing in outline, and so far decorative as not to be unsightly in the interval which must elapse before they can be overgrown.

In Fig. 20, I have sketched an arch which will be picturesque from all points of view. I have shown it as chiefly constructed of larch or fir, but with the sides partly filled-up with random bangle-work. The design might be varied by filling-up the whole of the space within the main framework in the same manner. Five feet six inches would be a proper height for the posts of such an arch above the ground-line, and I have supposed the example given to be 2 feet 3 inches deep: the width must, of course, be regulated by that of the path to be spanned.

As a material for garden arches some persons have a dislike to rustic-work, and prefer iron. They say that a wooden arch decays and falls to pieces, almost before it is possible to get it well covered with creepers. And it must be admitted that an arch is a thing peculiarly liable to decay. Not being roofed over, like a summer-house or a porch, it is fully exposed to the weather, whilst its covering of creepers holds the wet to it and prevents drying. Yet rustic-work has so greatly the advantage over iron in appearance, that I presume few persons of good taste would make it give place to the latter. The above objections should, however, warn us to use only wood of the most enduring kind at our command for this purpose.

Step-Stiles.—In connection with a tolerably large garden, few things in rustic-work admit of being made more effective and picturesque than a step-stile; and there are cases where, as a mere matter of utility, it has advantages over every other mode of ingress and egress. Such a stile is, of course, intended for occasional use only, and no one would think of placing it at the ordinary entrance; but where occasional convenience only is required, the owner may feel no inclination to cut an opening through a good and sound fence, or his landlord may object to such an opening being made. A step-stile enables him to bridge over the difficulty. By using this expedient the fence is left intact, and no danger is incurred of laying open the garden to incursions from neighbours' cattle; whilst such a fanciful construction adds not a little to the attractiveness of the grounds.

Fig. 21 is a stile designed for spanning a tolerably wide hedge and ditch; its length from end to end being 12 feet. The highest step in this stile is 5 feet above the ground line; its total height to top of railing is 8 feet. The width, not indicated in this side elevation, is 2 feet 3 inches.

In the section at Fig. 22 is shown the arrangement of those pieces which form the steps and the bridge at their top. The manner in which the ends of the steps are fitted to the slanting pieces which support them is explained by Fig. 23. A better and more characteristic way of fixing the step and bridge pieces than by nailing, is by boring auger holes through them and the pieces beneath, and driving pegs. Care must of course be taken to make the pegs of well-

seasoned wood, or they will shrink and become loose. After they have been driven into their places it will not be desirable to trim them off neatly. They look better with the rough ends left projecting at full length. This adds to the rude and picturesque character of the structure, and by making the construction plain to the eye increases the appearance of strength. The bridge is supported, and the whole structure strengthened and bound together by the diagonal braces from post to post, shown in Fig. 24. This erection is supposed to be wholly formed of larch, or some similar wood.

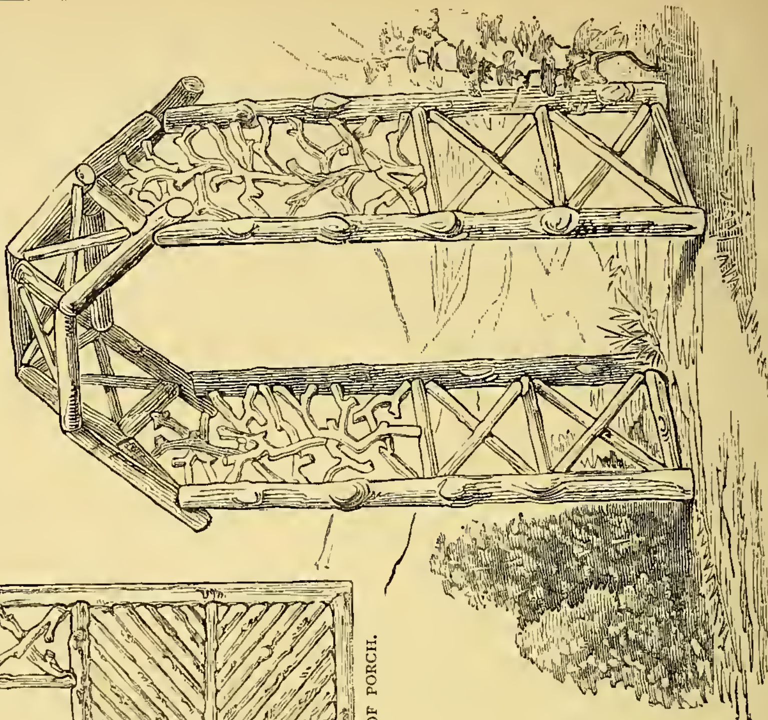


FIG. 20.—GARDEN ARCH.

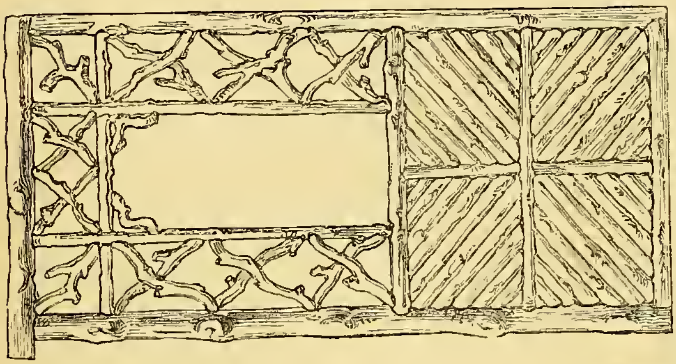


FIG. 19.—SIDE OF PORCH.

A narrower fence might be spanned by the more simple structure given in Fig. 25. Apart from the decorative railing, four pieces of slanting wood, crossing at almost a right angle, and nine short pieces fixed against them as steps, form the stile. In the ornamental railing I have used a mixture of straight fir and rough oak branches.

In my next and concluding paper on this subject I shall give some designs for fences and various articles of what may be termed garden furniture, as they are for use in, and embellishment of, the garden.

(*To be continued.*)

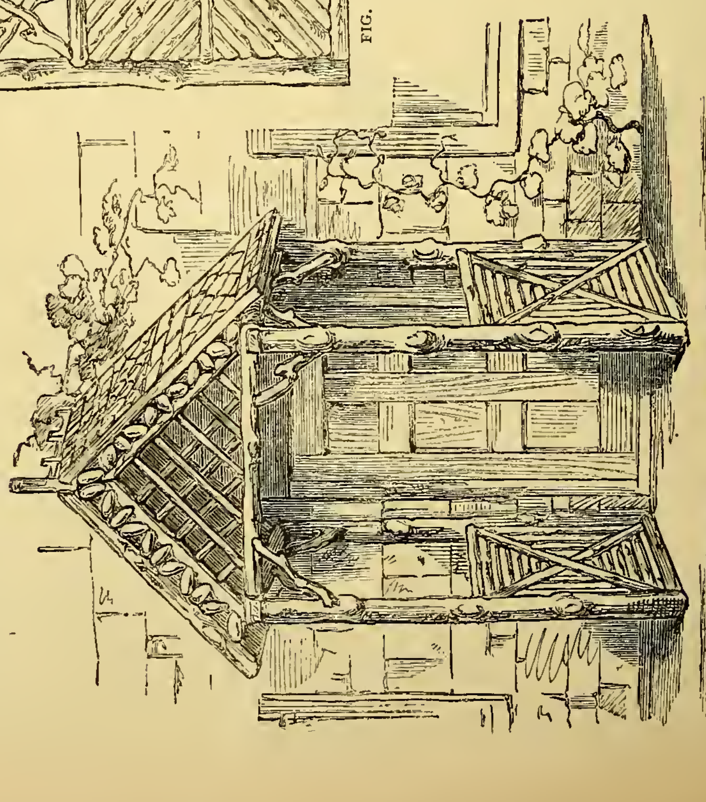


FIG. 18.—RUSTIC PORCH.

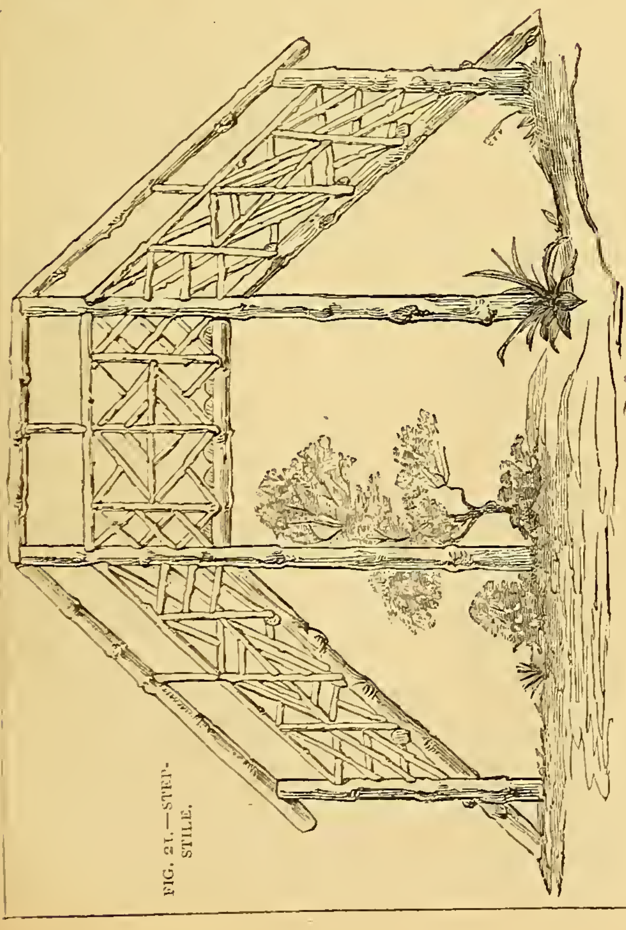


FIG. 21.—STEP-STILE.

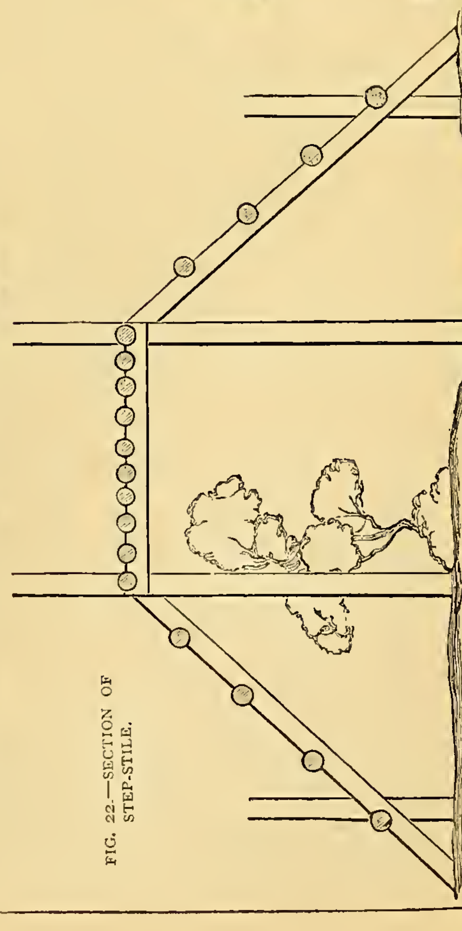


FIG. 22.—SECTION OF STEP-STILE.

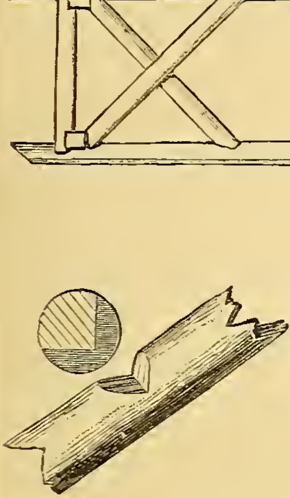


FIG. 23.—END OF STEP.

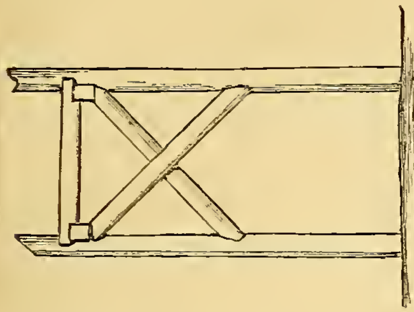


FIG. 24.—DIAGONAL BRACES BETWEEN POSTS.

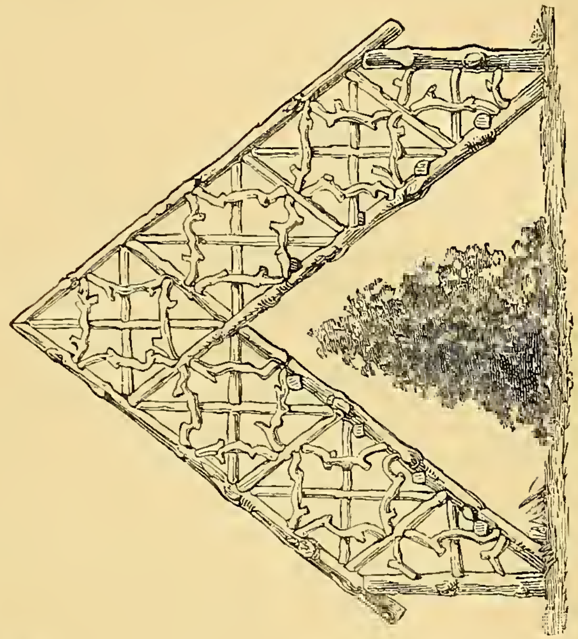


FIG. 25.—NARROWER STEP-STILE.

THE VIOLIN: HOW TO MAKE IT.

By EDWARD HERON ALLEN.

V.—THE BELLY.

THE BELLY.—Your pine, or belly slab, is still untouched, having one side arched and finished, and the other flat. You will commence by marking out on its arched surface the *f f* holes by giving its model the last touch as follows. In p. 253, are given directions for copying any single, or pair of, *f f* holes. If the belly from which you are copying is detached from the instrument, and you have copied its two *f f* holes as described in p. 253; having traced down your parchment the centre line, or join of the belly, and having transferred it to a leaf of wood (not more than $\frac{1}{16}$ or $\frac{1}{20}$ of an inch thick) cut it down the exact centre line with a sharp knife, so as to produce the model represented in actual size in Fig. 38. The explanation of this figure is as follows: It is an actual working size model of an *f* hole, taken from, and corresponding with the outline, etc., represented in *Supplement* (Part XVII.). In this an *f* hole is drawn; but only to indicate which half of the outline represents the belly. In Fig. 38, A A′ A′ represents A B, in diagram in *Supplement*, the centre join of the belly, the line A A A A is the plank model of your *f* hole as cut out, and with its flat side set to coincide with the line A′ A′; the figure shows its exact position on the belly, shown by the dotted outline C C. A nick, B, is cut in the flat side of the model, exactly opposite the inner cranny (G) of the *f* hole. The belly represented in *Supplement* is $14\frac{1}{8}$ inches long; measure from the top, down the centre line (which should be marked with pencil for convenience) $7\frac{13}{16}$ inches (or from the bottom, $6\frac{5}{16}$) and make a little mark. Now set the nick B of Fig. 38 at this mark, and see that the line A′ A′ exactly lies on the line A B. The model is on such thin wood, that on pressing it, it will bend and lie close on the arching of the belly. Take a *very fine pointed* pencil, and holding the model firmly on the belly with one hand, trace the inside of the *f* hole on to the belly with the other; turn the model over, and exactly repeat the process on the other side for the other *f* hole, and your *f f* holes are marked on your belly.

Now, if you are not following the model in *Supplement*, or if you wish to use some other *f* hole (say one of those on p. 105) trace it from there, or with a dirty finger or glove, as described on p. 253, and set and mark it on the belly, according to the relative distances it should hold on the belly and which are planned out by the dotted lines on Fig. 38. You will have to mark (as before) the point B on the centre line, opposite which, to set the cranny G of the *f* hole. This you can do, adapting the directions given above by common-sense to the outline you have chosen, or by comparing the fiddle from which you are copying. Its position with regard to the outline and centre join of the fiddle will then be as follows:—

From B′ to B″, $\frac{7}{10}$ inch.	From E to E′, $\frac{7}{16}$ inch.
„ C′ to C″, 1 „	„ F to F′, $\frac{13}{16}$ „
„ D to D′, $2\frac{1}{8}$ „	

These measurements are of course taken from the *Supplement* and Fig. 38, but if another model is being worked upon, an intelligent workman will easily adapt them; the difference being probably only in the lengths of the lines D D′, E E′, and F F′.

The *f f* holes being marked, now put the finishing touch to the arching of the belly, viz., the sinking noticeable in all well-made fiddles just *outside* the *f f* holes (*i.e.*, between them and the edge) and indicated on Fig. 38 by the slight shading on the right hand side. This is a hardly perceptible groove, beginning in the lower bend of the *f*, extending just as far as shown by the shading, and so "melted" into the arching already given to the belly, as not to be noticeable unless looked for. Its depth will be to a certain extent regulated by the model you are working on, but will not generally be deeper than the groove you ran round the sides (Fig. 33). It must be begun with a flat gouge, "melted" into the arching with the smallest curved plane, and finished off (like the rest of the belly) with the scraper. Be careful in doing this, not to obliterate the marking of the *f f* holes (except at the inner side of the *lower round* hole of the *f*, which cannot help being gouged away, but can be at once remarked) and particularly be careful of the raised edges of the fiddle, which are in considerable danger during this operation. So bear in mind in this, as in all the stages of your work, the motto "*Cavendo tutus.*" When the scraping is finished, you will give your tables a rub all over with medium sand-paper, and then re-mark your *f f* holes which will have got partially obliterated by the handling of the belly since they were traced. When they are re-marked, punch out their round holes in the following manner:—

Take the two piercers (or *f* hole punches, Fig. 32), and setting the bigger of the two exactly in the centre of the *lower* circle of the *f* hole (which it will not quite fill), and holding exactly underneath it a small block of wood to press against, press the punch firmly into the wood, twisting it at the same time, so as to cut out a little disc of wood. You need not punch right through, but no harm is done if you do; indeed, the hole going through to the flat side serves as a guide when you begin to scoop out the belly. Repeat the process with the larger punch for the lower circle of the other *f*, and with the smaller piercer punch out the

upper holes in the same manner with these latter. You must be very careful to place it exactly before beginning to cut, for you will find that the smaller punch (C, Fig. 22) has exactly the diameter of the upper circles of the *f* hole, Fig. 38. (The big punch is *just* smaller than the lower circles.) After (and possibly during) this operation you must pick the pieces or discs of wood out of the bore of the punches by means of a sharp point (such as the marking point), being very careful in so doing not to injure the cutting edge of the piercer.

Now commence to scoop out the belly, which is begun in the same way as the back, placing the arched side downwards on the cloth, and the edge against the beam; and you will gouge it in a similar manner, so as to have it $\frac{1}{6}$ inch thick *all over*. Be very careful how you cut, for this belly pine is as tender as cheese under the chisel, and before you know where you are, you will find yourself through the plate, and an irremediable injury done. If in an unguarded or absent moment you cut it too thin, you must take one of the thick shavings which fits the gouge mark which has gone too deep, glue it in neatly, and when dry go on with the operation. When this has gone as far as it is safe to go with the gouge, take the sharpest and finest curved oval plane, and plane over the entire inside of the belly most carefully, till all the gouge marks have faded into the plane furrows. You may then cut your *ff* holes, which at present are only punched out as above described. They are cut out with a very fine bladed knife, which is introduced from underneath as you hold the belly with your hand against your body. Begin by cutting round the lower circle, so as exactly to conform to the pencil marking, then cut the lower curve of the *f*, *always cutting against the grain and inwards*, *i.e.*, *towards the centre join of the plate*; otherwise, you will *infallibly* split off the corner of the "wing" (H in Fig. 38), and such a mishap is almost irremediable. If you do have an accident, and can preserve the tiny bit chipped off, glue it on *at once*, wedging it in its place by means of shavings set in the lower circle of the *f*. When you get to the lower point (I, Fig. 38), press the knife strongly, and work it through the narrow channel into the long part of the *f*, and proceed as follows:—Cut a groove right down the centre of the *f* with two *carefully guided* but strong cuts of the knife, and pick out the splinter thus loosened. Continue this groove till you go through to the other side, and then, working carefully from underneath as before, cut out all the wood in the long part of the *f*, keeping most carefully to the pencil lines, and being especially cautious when you are cutting in the channel I. The top curve and circle are cut out the same as the lower one, the crannies G are neatly cut out, and the opposite *f* hole is cut out in the same manner. If you chip off a corner (H) beyond hope of repair, or lose the piece, you must remedy it by cutting the angle at I sharper and that at H more obtuse, and making the opposite *f* similar. But it will be a thousand pities if you mar the symmetry of your belly by such a mishap, so guard against it *by always cutting against the grain in the direction* H *to* I, *and never* I *to* H. (Fig. 38.)

The *ff* holes being cut out, they will serve as a further guide to determine the thicknesses; so with the finest plane and scraper proceed finally to adjust them *inside* the gauged border-line and block-boundaries, till they are left as follows, according to Fig. 39, which represents the inside view of the belly:—At the centre, A A, it must have a substance of $\frac{9}{64}$ (just over $\frac{1}{8}$ inch); it must only just thin off (say $\frac{1}{20}$ less) at the edges marked C C C C, and must be a shade thicker just over the sound-post B. Finally, adjust these thicknesses by means of sand-paper, and then correct any little faults or roughnesses which may be found round the *ff* holes, being, of course, cautious not to alter their shape in any way.

You can now shape your bar, and affix it to the belly, first of all marking its place on the belly as follows:—It will be placed on the right hand side of the belly as you work at the inside. Make 3 small marks at the exact centre of the belly—1, at the broadest part of the upper bouts, D; 2, exactly midway between the crannies of the two *ff* holes, E; and, 3, at the broadest parts of the lower bouts, F. If your join is *exactly* in the centre, these marks will be on the join; but it sometimes happens that it is not quite so, in which case the true centre must be marked between the outside edges with compasses, and a line drawn to connect the three marks. Now on the right of these three marks mark three other marks, G, H, I. The top mark G being $\frac{3}{4}$ inch from the exact centre, D; the middle one, H, being $\frac{4}{5}$ inch from the centre mark E; and the lower one, I, being $\frac{5}{6}$ inch from the centre mark F, and connect them with a pencil line. Now from two points rather to the right of the top and bottom blocks draw the two short lines J, K, $1\frac{11}{16}$ of an inch from the upper and lower edges, and lengthen the line G H I, till it touches them. This line, therefore, marks the exact *locale* of the bar which will be glued, with its outer edge just touching it. Take a strip of fine even-grained pine, about $11\frac{1}{2}$ inches long, and plane it till it is just $\frac{3}{16}$ inch thick throughout its length, and perfectly straight and parallel. Cut it about 1 inch broad, and slope off the two ends on one side, so that it roughly takes the shape of the inside of the belly, its two ends touching the points J and K. Now make a mark and draw a line across this rough bar at the point H, and mark the top and bottom of the bar to distinguish them. Before commencing to

fit the bar, take a slip of wood about 4 inches long, and about $\frac{1}{16}$ thick, and $\frac{1}{3}$ broad; insert this into the middle of the *f* hole nearest the bar (*i.e*, the left hand one, looking at the front of the belly) and under the corner, as in Fig. 40, which represents the operation viewed from the outside of the belly. Its object and result will be to press up the "wing," *a*, and press down the lower wing, *b*. The strings will correct this discrepancy by their pressure; if this precaution were not taken, the pressure of the strings would force the wing *a below* the wing *b*, which would be hideous to the last degree. This precaution gives the belly a *temporary* excess of rise, to which the bar is fitted, to maintain it till the greater influence of the strings is exerted. The bar being roughly rounded to shape, it may now be accurately fitted; for this purpose it is set in the belly, and fixed at its two ends with sound bar clips (Fig. 15). It being thus held, you can hold it sideways, and mark on one side where it must be cut down; take it off, correct it, and refix it with the clips over and over again till it adheres closely on both sides to the belly throughout its length. Care must be taken each time you set it in the belly to place the centre mark on the bar, on the point H on the belly (Fig. 39), and also to place the top of the bar at the top of the belly, and *vice versâ*.

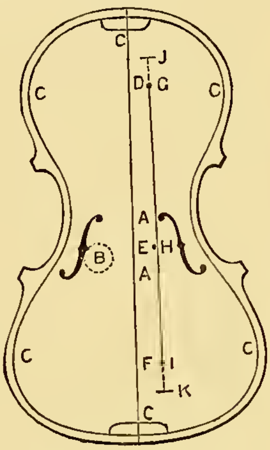


FIG. 39.—DIAGRAM SHOWING INSIDE VIEW OF BELLY.

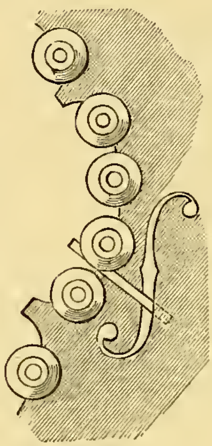


FIG. 42.—DIAGRAM SHOWING METHOD OF SCREWING ON BELLY.

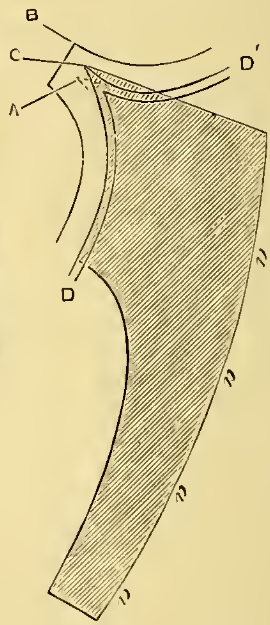


FIG. 43.—MODE OF TRACING PURFLING FROM STRADIVARI VIOLIN.

FIG. 40.—OPERATION OF FITTING BAR.

FIG. 41.—DIAGRAM SHOWING METHOD OF SHAPING BAR.

This operation of fitting the bar may be done in ten minutes, and it may take hours, for it must be absolutely exact throughout its length, so that when glued it seems to be cut out of one solid piece with the belly, and again it must be at exact right angles with the edges of the belly, as in Fig. 28 (p. 169, Vol. I.), which will be more difficult to attain, because of the slope of the arching. When, however, being fixed by the clips you can no longer see a cranny below it at any point, it may be just finished with a flat file and glued into its place, *i.e.*, just on the line G H I; if by reason of the narrowness of your model the bar overhangs the top circle of the *f* hole, so as to obstruct it, it must be set throughout its length and parallel to the line G H I, a little nearer the centre, so as just to clear it. When glued, it must be fixed in its place by means of three wooden bar cramps, and left to dry. Whilst gluing in the bar you may as well "size" the belly ends of the blocks with glue, to fill up the pores before gluing on the belly, in the same way as you did before gluing on the back (*q. v.*), *i.e.*, with hot iron and file. When the gluing of the bar is dry, take a small fine plane and cut it into shape, which, when finished, should be as follows in the middle (*i.e.*, at the point H), it should be at the middle $\frac{2}{5}$ths of an inch deep, therefore plane away till this measurement is obtained at H, and the top of the bar is plain and straight; then proceed to finally "shape" it. From the point H it must soften off to the belly at the ends, the extreme ends being finished with a knife, not scalloped, but merely softened down to the belly, so as to have about the shape of Fig. 41. A shows the finishing of the ends, B the shaping of the edge of the bar not glued to the belly; this last is obtained by means of a file and sand-paper. When the bar is thus finished, take three squares of glass-paper of progressive fineness (the last being very

fine), and carefully smooth the whole inside of the belly till it is perfectly soft to the touch. Then take a flat and round file and bevel off the inside edge of the fiddle in the same way as described for the inside edge of the back, as represented at Fig. 35, then in a manner similar to that there described, clean and smooth the edge you have left round the scooping of the belly, and this having been done, your belly is ready to glue on. For this operation you must increase the glue in the pot to twice its bulk by the addition of water, so as to dilute the glue, and render it much weaker than that with which you "sized" the blocks and fixed on the back. Some people, before gluing on their bellies, put curious, historical, or sentimental inscriptions out of sight, up in the upper bouts of the fiddle. The old Luthiers were very great at this, and now in taking the bellies off old fiddles, quaint couplets and mottoes are often brought to light. Before applying the glue (which is not done after the belly is fitted, as in the case of the back), set the belly on the ribs with a couple of screws, and look round it to note the points where they will require pressing or stretching to shape, for the longer the time that elapses between the gluing on of the back, and of the belly, the more will the ribs twist and warp out of shape. When, by this means, you have arrived at an approximate notion of what difficulties you will have to contend with, spread the glue quickly all over the top edges of the blocks, sides, and linings, being very careful not to let any run down *inside*, for though any that runs down *outside* may be washed off, any that trespasses inside cannot be removed *after* the belly is on. Having got a buttering of glue spread all round, set the belly on, and screw it fast all round, beginning with the C's, or inner bouts, being most particular to avoid the corners * (as in Fig. 42), then fitting the ribs and putting on the other screws and cramps the same as with the back. This must be done quickly, but not without care in adjusting the edges, for the glue soon sets; and particularly do not attempt this performance until you have precluded all possibility of draughts or currents of air, which would seriously increase your difficulties; but to counteract this evil, the application of the hot water, when you wash the superfluous glue from the sides will remelt it and aid the operation. When the screws are applied, set a slip of wood in the *f* hole from one of the screws, to keep down the lower wing and raise the upper one (just as a while ago you set a similar slip from the corner), as shown in Fig. 42. This being done, take a brush and some hot water and wash all round the sides, to remove any superfluous glue, and

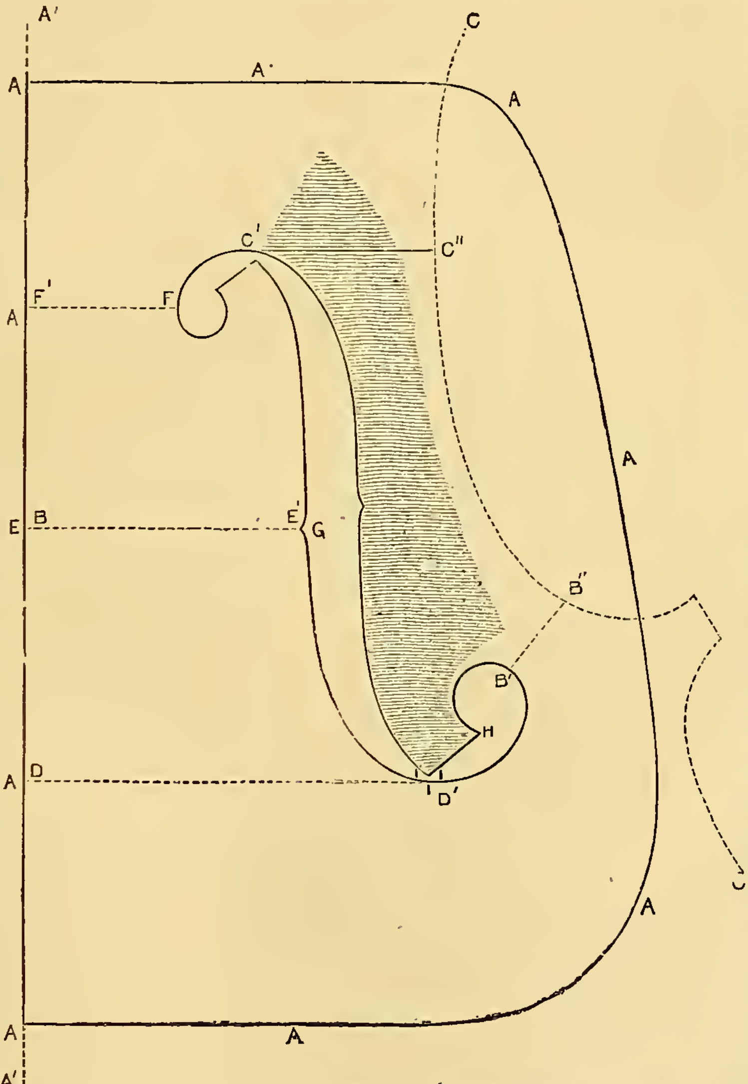


FIG. 38.—DIAGRAM SHOWING METHOD OF MARKING OUT *f* HOLES ON BELLY. ACTUAL SIZE.

* If you do by any chance split a corner, mend it at once according to the directions given for "Repairs."

re-warm and set that which is to keep the belly on. In applying the screws to both back and belly, when fixing them the head (A, Fig. 16) must be on the side which is glued (*not* the moving collar B), otherwise, when you wash away the superfluous glue it will get washed into the collar B, and fix it to the screw. Set the belly aside in a warm place to dry, and when quite fast, remove the screws. You will now look round the edges, and wherever they appear to be too broad in proportion, they can be reduced by means of a sharp knife and file, and the corrections neatly finished with glass-paper.

It is now that you will see the advantage of not having purfled before scooping the back and belly. If you had done so, your edges must have remained as originally cut, whether quite coincidental with the ribs or not; but as it is, where for the sake of uniformity you now slightly reduce the edges, the purfling may be made to follow the correction which it will now hide, instead of showing it up, as it would have done if already inlaid. Take the purfling gauge (Fig. 17), and setting the cutter, which must be thoroughly sharp, $\frac{7}{32}$ inch from the rounded part of the stem A, trace a line, not letting the cutter sink deep all round the tables, back and belly. Then reduce the distance from the stem to $\frac{5}{32}$, trace another set of lines round back and belly, which will be outside the first. This seems simple enough to say, but you will find it most difficult to preserve a uniform distance from the edge, the stem requiring to be pressed very strongly against the edge, as it travels round, especially on the tender pine of the belly, and the second line it will be most difficult to preserve at an exact distance of $\frac{1}{16}$ from the first; however, *festina lente*, and patience, and careful perseverance will overcome all this difficulty. Mind and not cut these marks too deep; they are only to serve as guides for the knife, in cutting the groove in which the purfling is laid. The curve of the marking will have been interrupted at the top of the back by the button, and the corners must be re-marked to have the purfling in true Stradivarius style. If you look at any Stradivarius you will see that at the corners the purfling is not finished off in the middle of the corner (as at A, Fig. 43), but pointed up (or down, as the case may be), to the point B, as at C, Fig. 43. This is a small particular, but is a great point in the purfling of Stradivarius. To mark this "style," and to complete the tracing of the purfling, prepare a slip of wood exactly similar to the shaded piece on Fig. 43, which is prepared from a Stradivari instrument. The surface *a*, *a*, *a*, *a*, represents the completion of the curve at the top of the back, which may be traced by its means. The purfling at the corners is at present as shown by the dotted line at A. The guide slip must be set on the 8 corners, coinciding with the curve, as in Fig. 43, but, as there shown, altering the position of the joint as at C. The curve of the purfling in the inner bouts must be brought round to meet this point, so that when finished the tracing of the purfling will be as represented by the double lines D D′, Fig. 43. When these are marked, proceed with a sharp pointed knife to cut round the two lines of the tracing on back and belly till the purfling is marked by two even, parallel, and cleanly cut lines $\frac{1}{12}$th of an inch deep. You must be most careful in this operation to guard against letting the knife slip away from the lines, as this will spoil the symmetry of the purfling, and in the purfling it is that the true delicacy of handling and workmanship really shows itself in the construction of the fiddle. When the lines are cut, pick out the wood from between them with the purfling chisel (Fig. 21), being very careful that the lines are cut deep enough at the corners, or you will pick out a piece too much at this point and spoil its finish. Let the depth be made even and smooth all round the instrument before proceeding further.

At this point, however, having already exceeded the space that is allotted to me, I must stop in my description of the successive steps to be taken in purfling the violin, as there is another operation to be performed before completing the purfling, but this must be left for the next chapter.

(*To be continued.*)

FERNERIES:

HOW TO MAKE THEM AND MANAGE THEM.

By DONALD BEDE.

III.—SOME FERNERIES FOR INDOOR DECORATION.

BEFORE proceeding to describe the class of designs illustrated in the present Part of AMATEUR WORK, the reader may possibly be desirous of receiving some information as to stocking and managing those which have appeared in the former Parts; and here be it mentioned, with devout thankfulness, that in the pursuit of cultivating and collecting ferns, it is possible to derive much pleasure and success without being compelled to remember the "crack-jaw" Latin names, which by common consent are the regular means of designating these lovely objects of the botanical world. Indeed, I am often amazed at the facility with which nurserymen roll forth, "*Gymnogramma leptophylla*," "*Ceterach officinarum*," and scores of other such apparently meaningless names, which are attached to, but not always in harmony with, the lovely forms and

graceful curves of the ferns. Of course, one is compelled to use these names in order to designate to others which are meant; but, personally, I try to forget them on all other occasions, so the reader is warned not to expect in the parts of these papers relating to the management of ferneries, anything approaching to "A Dictionary of the Proper Names of Ferns," contenting myself with giving such simple practical advice as I have proved in the matter.

In stocking Figs. 1, 8, 9, 10, and 14, unless they are intended to be placed in a conservatory, or glass house, only hardy ferns, such as grow in the open, should be planted; and before the fern mould is put in, some loose cinders should be placed in the base of the stand, whereby a simple and effective system of drainage will be set up. After having placed some mould upon these, lay some sprigs of ground ivy, with the leafy ends projecting a little way outside the pockets, on top of which plant the ferns, and if these be transplanted from pots, take care to break up the mould on the outside. The upper tiers of pockets will not require any drainage, for obvious reasons. With regard to the kinds of ferns to be planted, this is a matter very much of individual taste; the common hartstongue, in its varieties, is very suitable, its wealth of foliage, though homely, is very attractive. In contrast to these, say in the next pocket, some such fern as the Nephrolepis, which stands a lot of rough usage and neglect, and with its comb-like leaves, is very pretty and interesting. Some small specimens of plume-like ferns, interspersed here and there with a tuft or two of creeping saxifrage and some sprigs of lycopodium dibbled in after all has been planted, will probably satisfy the beginner.

The stands should be placed in a shady position, free from draughts (this latter point is of vital importance), water little, and often. Of course, these *open* ferneries must not be expected to retain their freshness and luxuriance during the colder months of the year, unless kept in a temperate room; and, moreover, when a considerable number of plants have been somewhat crowded together for a season, it will be advisable to replant the whole the second year.

In Fig. 8, some less hardy specimens can be grown; the temperature within the glass being much higher, and also quite free from dust and draught (should the slightest suspicion of mould be apparent, occasionally air the interior, by removing the glass for a few minutes), this kind will not require nearly so much watering, as the moisture given off by the ferns is condensed by the glass, and returned to the soil. The same kinds will also do for Fig. 1, p. 114. Those who cannot collect ferns in the country themselves, may procure, at very moderate prices, almost every ordinary variety, from Messrs. Strood and Sons, *Lordship Nursery, Green Lanes, N.* But, however choice and rare the ferns, nothing will give such a zest to the cultivation, as collecting them yourself, probably on some brief holiday tramp in the lanes and woods of fern-growing districts. Well do I remember the enjoyment of watching the growth of some tiny specimens of the Adiantum nigrum, or Black maidenhair, which I had collected at the risk of my neck, from the crevices of some precipitous rocks in the Isle of Man, which, by-the-bye, were growing without a particle of soil of any kind; their long thread-like roots, which extended a foot or more into the crevices, seemingly existing on the moisture condensed by the surface of the rocks—an enjoyment very much heightened, when these, together with some other varieties picked up in various out of the way places, were awarded a prize at a local horticultural show—a pleasure which, I suppose, only the amateur can feel.

In planting ferns, the amateur need hardly be reminded to avoid all regularity, the more the effect of "studied confusion" is obtained, the better. One way of achieving this is to under-plant some dwarf specimens; there is one of this kind, whose leaves are about 1½ inches long by about ¾ of an inch wide, having about six or seven sections on each leaf, the root of which is a native of the sand hills of South-west Lancashire, and adjacent districts. Nothing can exceed its power of endurance or its vitality in bits; its nature would seem to go far to account for the old saying, that "all the ferns have one root," for some of it will run the entire length of a lane or cop. A pretty and natural effect is produced by burying some pieces of such roots under the other, and allowing them to come up in picturesque confusion; or placed in the hanging basket (Fig. 1, p. 114) with holes bored in the cement, the fronds soon find their way to the light, and present a very pretty appearance, at once natural and pleasing.

To proceed, however, to the instructions for making up the accompanying designs. Fig. 17 is a simple oblong cottage top fernery, having no pretensions whatever to a decorative design, but is intended expressly for the beginner more as a practical lesson in zinc working than anything else. It will be seen that the frame is made entirely of bar zinc, a material which is sold in a variety of patterns in 8 foot lengths, by weight. The amateur had better procure from Messrs. Treggon & Co., *Jewin Street, City, E.C.*, a printed sheet of illustrations representing full size sections of the various bars, which are all numbered. For the purpose of constructing Fig. 17 we shall require some No. 36 and some No. 2 T-bar. Having procured the requisite quantity, clean off the grease, which is always more or less on it after leaving the draw bench,

by rubbing it with a rag wetted with paraffin or turpentine. This being done, cut up into requisite lengths; an ordinary dovetail saw will answer this purpose well, and the mitres can be cut on an ordinary mitring block.

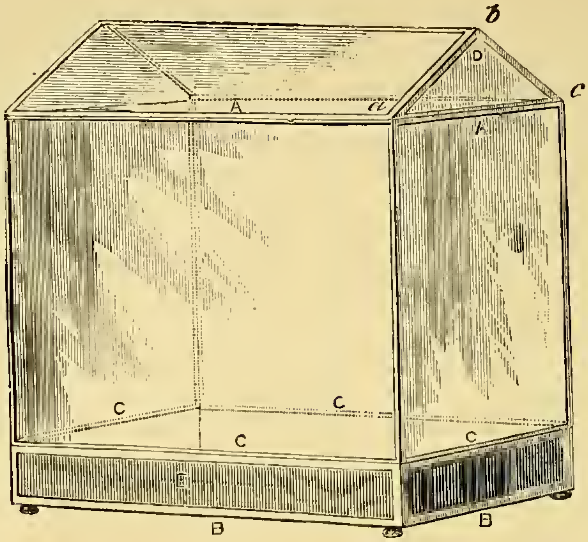


FIG. 17.—OBLONG COTTAGE TOP FERNERY.

The size of Fig. 17, when complete, will be, length 22 inches, width 11 inches, height to top of straight 16 inches, slope 8½ inches; unless you have a long bench, which is unlikely, it is better to cut up the lengths ½ an inch larger at first and mitre them afterwards. It will be observed that all the angles of Fig. 17 are right angles, except those formed by the sides to the slopes, so as to be easier to work up. It is cutting up these mitres and soldering the same so square and true that the beginner finds so difficult, and this can only be overcome by practice and careful attention to extreme accuracy in measurement when cutting; also, in making up do not trust to the eye, but make constant use of the square, as unless the top and bottom are true, and also true to each other, it is impossible that the "uprights" can be perpendicular when fixed in their position.

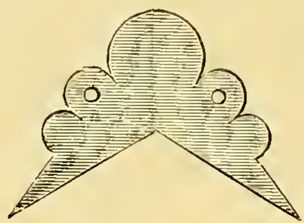


FIG. 19.—CORNER ORNAMENT.

Doors are omitted in Fig. 17 in order to simplify the work, the interior being reached from the top, which is not fixed to the other part. It will be best to commence by cutting the material for A and B first; these are made of No. 2 T-bar, and correspond in size. See that the four long lengths and the four short ones are perfectly alike in measurement, then solder up, using spirits of salt as a flux for the solder; the amateur will notice that a hotter iron is needed to make a zinc joint than for tin work, also that the thickness of the material requires that the parts should be "sweated" together, or a very weak joint is the result. Having made these true to each other, cut out the uprights of No. 34 equal angle, solder these on true to the square; having done one reverse it, and, if true, it will exactly fit the other, so that at whatever point forming the angles of the cube, it will show a true right angle with the square. If the amateur has succeeded in this at the first attempt, he will deserve hearty congratulations. A flat sheet of No. 10 zinc must now be soldered on to the bottom, then some straight pieces joined across the fronts and ends, C, which will form the growing part when glazed, as it will be later on. File up the work nicely, and rub down clean with some emery cloth. Put on four feet with screws, as in former directions. The top is made up of No. 34 bar exclusively, and should fit easily so as to allow for the paint; a number of holes bored in the bottom and in the top ridge, or a little aperture left in the glazing at the corner, D, will supply needful

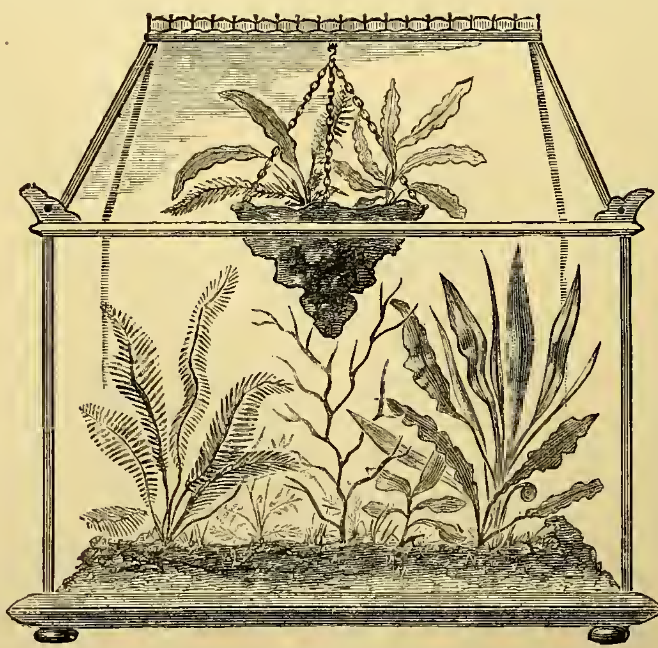


FIG. 18.—ORNAMENTAL FERNERY, WITH HANGING BASKET.

ventilation. The glass parts, E E, and corresponding parts, should not be too thin, and after being puttied in should be painted inside with two coats of colour —chocolate looks well for the exterior decoration; paint over all, and as soon as the smell of it has gone off, the ferns may be planted in. The former directions as to drainage being carefully observed, the beginner will probably find a little difficulty in cutting the mitres for the end pieces of the top, and will find it convenient to proceed as follows. Draw on a board, or on top of the bench, an equilateral triangle the exact dimensions of the ends of the top, as at *a b c*, Fig. 17. Place a piece of the angle bar on the line as at *b*, and mark off the line of mitre cut, and so with the others; also, when soldering together do so over these lines. If this is done carefully both ends will be perfectly alike, and a true fit obtained. The glass for the top may be set in with plaster of Paris with advantage, securing as it does great rigidity, which, as the top will be frequently handled, is of considerable importance.

The amateur will probably by this time, seeing the ease with which bar zinc can be worked, be very anxious to construct something more ornamental in design; for this purpose, Fig. 18 is recommended as an easy stage in advance, and although being very simple in character, looks, when finished and stocked, exceedingly attractive, and by no means out of place in a handsomely furnished drawing-room. When complete, its dimensions are: extreme height, 2 feet 6 inches; length, 2 feet 6 inches; width, 14 inches; height from base to shoulder, 17 inches; slope of top, 11 inches; and should be decorated in chocolate and gold, white and gold, or black and gold; avoid every shade of green, the ferns will supply this. The framework consists of four different kinds of bar, viz., base frame, No 31, pillars, No. 46 equal angle; shoulder frame, No. 28, bottom and ends of top No. 8; ridge bar, No. 8, surmounted with a suitable fret pattern, such as No. 54. The various instructions in detail of Fig. 17 will hold good in this and other designs. It will be seen that the antiquated method of having a box-like space at bottom for the ferns to grow in is dispensed with, and a much more attractive plan adopted, viz., an oblong rim of zinc 2 inches deep is placed in the bottom of the case before glazing, and this covered with Roman cement, forming an irregular line, the same manner as already described for the rockwork. When this is done, and the case glazed, some thin cement is run in all round about ½ inch deep. The ferns are built up in irregular heights, and banked up with moss where the mould is left bare. Some fine shingle or sea-shells placed between this and the glass gives a very pleasing effect. End doors are quite unnecessary in such small cases, as the ferns are easily got at from the top. The ornaments on the four corners are formed by cutting out of No. 10 zinc pieces to pattern of Fig. 19, which being bent to a right angle in the centre are soldered on. A basket, as in Fig. 1, page 114, completes the fernery. Dibble in some sprigs of lycopodium after the ferns are planted.

FIG. 20.—IMITATION OF TREE FERN.

Fig. 20 represents an imitation of a tree-fern, the stump of which is formed of a hollow tube covered with rockwork cement, and, if properly made, forms an exceedingly interesting and somewhat unique fernery. Make a zinc tube, about 18 inches long by about 4 inches wide at base, and about 3 inches at top. Make a number of irregular-shaped holes at various points with the rough edge outside, cover the tube with two or three coats of Roman cement, leaving the holes open. Put the last coat on smoothly, and before it sets take a piece of wire and score it in imitation of the tree stump. When thoroughly dry, colour it a rich dark brown with dry colour mixed in boiled oil only—one coat is sufficient to leave it a dead dry brown. Set it in a large pan or other suitable receptacle, and after

placing a quantity of broken pot or other material for drainage about three inches deep, fill up with suitable fern mould; in the tube at top plant some luxuriant plume-like fern, and at the places down the stump where there are holes, plant seedlings or dwarf ferns, creeping saxifrage, etc.; while in the pan or tray at bottom, lycopodium and saxifrage planted along with some larger specimens, allowed to grow over the sides—the greater the variety of young plants on the stem the more pleasing will be the result. The large quantity of mould which is contained in the inside will insure the development of the ferns for several seasons. Particular care should be taken to keep the whole thoroughly moist. This plan will probably commend itself to many in towns who are possessed of a small glass house, as both hardy and tender ferns can be grown in this way, and thus an elegant table ornament is always at hand. Nor is there any reason why they should not be used with advantage as the centre of an inside window garden, where the sun can be kept off.

(*To be continued.*)

A HOUSE FOR DOLLY.

By the EDITOR.

III.—THE FITTINGS OUTWARDLY (*continued*)—THE FITTINGS INWARDLY.

WE have yet the attic windows to deal with, and it is necessary to give a brief explanation of the method to be followed in making and fitting these, although there is no great difficulty in their construction. Once more I must remind the reader that we are dealing with this structure not on any stated scale of so many inches or parts of an inch to the foot, but on the broader principle of the lower rooms being perfect cubes *externally*, and that the length, width, and height of each, which are equal, are each divided into four equal parts. The height of the attics, also *externally*, was assumed to be three of these parts, and the slope of the mansarde roof in front and at the sides to be regulated by making the space or boards that form the top of the roof just three of these parts in length and breadth. This being the case, A B in Fig. 13 presents an accurate delineation of the slope of the roof, or the angle at which the front and sides of the shell of the roof are inclined to the floor of the attics, the figure itself representing part of the interior of the attic *in section*, to the right of A B, and *the elevation* of the side of the window and its roof, to the left of that inclined line.

The height of the opening of the window in *elevation*, that is to say, its height *perpendicularly*, from the surface of the attic floor to the architrave, represented in the figure by C D, is just two-thirds of the height of the attic. This, and the width of the opening cut for the windows right and left, are shown in Fig. 5, and it is unnecessary to say anything further on this point. It must be understood, however, that the projecting parts of the attic window are fixed to the roof boards on either side and at top of the opening, so that the sides of the holes cut for lighting the rooms are flush with the inside of the pieces that form the sides of the window. The first thing to be done is to prepare a slip of wood triangular in section, or, rather, having its section in the form of a right-angled triangle, as shown at A L F in Fig. 13. This is made by cutting and planing up a slip of the thickness required at the upper edge, and then planing away the wood from the interior of the upper edge until it is reduced to nothing at the exterior of the lower edge. The slip thus formed is called a feather-edged slip. When made, it should be placed round the bottom of the roof, the outer surface being in the same plane with the external surface of the shell of the structure. At the opening of each window the inner part of this wood will be sloping, and it will be necessary to rectify this by blocking up with a piece of precisely the same depth, and of the shape shown at A F G H in section. This makes all solid at the bottom of the openings, and forms an inner sill to the windows. The outer sill, shown in section at K in Fig. 13, and in elevation at C D in Fig. 14, is merely a slip screwed on to the feather-edged slip, both having their upper surfaces in one and the same plane, or, in other words, flush one with the other.

Next, pieces of wood, of the form shown at D E L F, must be cut to form the sides of the window, and the sloping edge, D F, is placed against the roof, having its inner surface flush with edge of the opening cut for the window. This may be done by the aid of long thin screws, passing through the boards that form the roof and entering the edge of the side, thus drawing it closely and tightly to the roof. These screws, of course, are put in from the inside of the structure. Before fixing, however, it will be necessary to make all the various parts of the attic front, and to fit them together. A groove may be cut in the inner surfaces of the sides and sill for the reception of the glass, in which case the glass must be put in before the roof is fixed on; but if it be thought better to leave the insertion of the glass until the window frame is fixed, a narrow slip of wood about $\frac{1}{8}$ inch thick should be nailed to sides and sill, to form a rebate in which the glass may be dropped. If this mode be adopted, room should be left for the reception of a small bead all round the window outside, put on with needle points, to hold the glass in its proper position. An

architrave to the window must be inserted between the sides, as at E, and the window may be divided nto two *quasi* sashes by a cross-bar at F, put in as in the other windows. The upper ends of the sides must be bevelled off to admit of the sloping boards that form the roof of the attic. The tympan between these boards is filled up with a piece of thin board. The upper ends are bevelled so as to rest against the ridge board B M, which at the end M is let for a short distance into the short ornamental upright N, the top and bottom of which may be turned in the lathe. At the end B it passes through the crest-board that runs along the front of the roof, shown in section at B O in Fig. 13, and in elevation at G H in Fig. 14, and passes into the fillet P, which is nailed to the top of the roof-board, at the distance of the thickness of the crest-board from the edge of the roof-board. Great care must be taken in bevelling the edges of the boards that form the roofs of the attic windows, so that the top edge of the bevel meets the roof-board on each side in a line in the plane of the top surface of the roof board of the house proper. Where the boards meet the post N, they must be notched, as shown at Q, that they may fall into place and butt properly and evenly against N. From what has been said, the method of making and fixing the attic windows will be apparent to all. It only remains to say that, in order to take away from the plainness of appearance that these windows will otherwise present, ornamental bracket-shaped pieces should be fixed to the sides and under the roof, as shown at R, S in side elevation in Fig. 13, and at R, R′, S, S′ in front elevation in Fig. 14. The lower ornaments at S, S′ are fixed on the upper edge of the slip A B, and to the sides of the window.

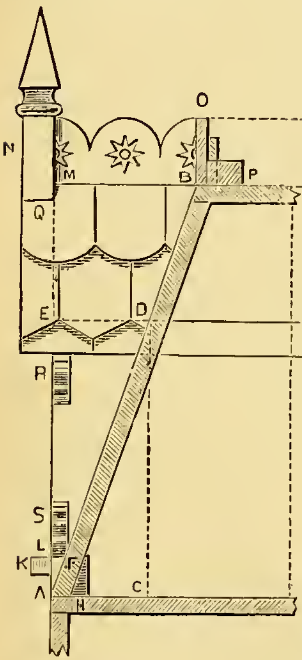
The triangular ornament shown between the windows in Fig. 3 rises from the slip A B, and should be bedded against a block, in section similar to the lower part of the sides of the windows. This may be in fretwork, but incised or carved work is, I think, preferable, and it may be taken advantage of to display the armorial bearings of the family to which the little owner of the house belongs, if that family be really entitled to bear them. Too little respect is paid to heraldry in the present day. I should like to see all who assume armorial bearings, without being able to prove their right to bear them, charged at least a treble rate of duty for the assumption; and as trade-marks partake very much of the nature of heraldic insignia, it is only fair and right that everyone who assumes a trade-mark for the better distinction of his goods should pay a tax for the use of it, as every *armiger* or gentleman is compelled to do who openly bears his arms. I have been led into a slight digression, which I beg respectfully to offer to Mr. Childers as an idea for the Budget of 1884—if he is then still in office. The ornament now under consideration, blocking at back and all, should be made in one piece, then fixed to the roof of the house when closed up, and finally sawn asunder with a very fine tenon saw. This will ensure an exact register of the ornamental work when the house is closed after having been opened. I do not give any design for this further than that shown in Fig. 3, for there will be scarcely an amateur who makes the house who will not have some fancy of his own that he will like to carry out in this, and very probably the other, ornamental work.

2. *The Chimneys.*—The method of making the chimneys is sufficiently shown in Fig. 3, and may be well understood by the aid of Fig. 13. A block of wood, similar in end elevation and shape to the side of the attic window, D E L F, must be made and fitted to the roof above the feather-edged slip which has been attached to the roof in front and at the sides. A block must be placed on each side, and from each block must spring three shafts, either round, hexagonal, or octagonal in form, according to the pleasure of the maker; but whatever be the form of the chimney shafts, the mouldings at the base and at the top must be similar in character. Those who have a lathe will, doubtless, make their shafts round; those who have not, will plane up a bit of wood perfectly square, and then proceed to cut out hexagonal or octagonal shafts; and the wood carver will ornament them with panelled work after the fashion of the old Elizabethan chimneys. They need not be carried higher than the top of the crest-board that surrounds the roof, and should, on no account, be higher than the ornament in front of each attic window at the top.

3. *The Roof.*—With regard to the roof, I have to call attention to two points, namely, the work in imitation of tiles, and the crest-board that surmounts the roof. To form the tile work, nothing more is necessary than to take thin slips of wood, not less than ¼ inch and not more than ⅜ inch in thickness, and having planed them on the outside, to reduce them to the condition of feather-edged boards by planing them away to a thin edge at the top in the inside. The edges must be cut as shown in Fig 14, and the slips glued on to the roof-board below, each slip slightly overlapping that which is immediately below it. Great care must be taken in joining the slips at the corners of the roof. If the amateur finds this a little beyond him, he can cover over and hide any defects with a roll or capping of wood properly grooved to fit over the slips. Any interstices between the *quasi* tiles and the capping can be filled with putty. The tiled work may be done in the solid, by taking pieces of ½ inch board, fitting them to the roof at the sides, and in front to the right and left of the

attic windows and between them, and then marking out the tiles with rule and pencil, and carving them out with a broad and very sharp chisel. The boards should be carefully mitred together at the angles of the roof before the carving is commenced. When finished, this external coating can be screwed down to the roof-boarding below.

As it has been already said, the crest-board surrounding the top of the roof is fixed to filleting, screwed down to the roof-board at the top at a suitable distance from the edge—that is to say, if ½ inch stuff is used for the crest-boards, the filleting must be screwed down ½ inch from the outer edge, or at a diagonal work of this kind, and which I will describe in these pages at no very distant date. The effect is most satisfactory. Each pattern, as will be seen on examination of the figure, is in the form of a square. This is divided into eight parts by lines passing vertically, horizontally, and diagonally through the centre. The circles are marked out with radiuses equal to ¼ and ½ of the transverse or vertical line. The method of dividing the circumferences of the circles and marking out the star is clearly indicated in the figure. The hole is made with a bit, whose breadth is equal to the diameter of the smaller circle, and the points of the star are then cut out with a



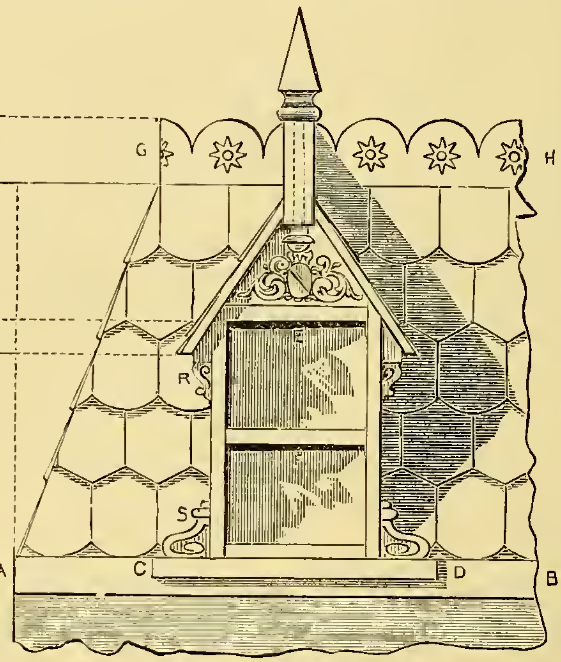


FIG. 19.—SECTION ALONG A B IN FIG. 18.

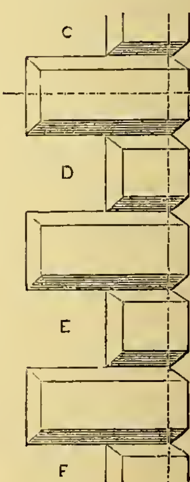


FIG. 13.—SIDE ELEVATION OF ATTIC WINDOW.

FIG. 14.—FRONT ELEVATION OF ATTIC WINDOW.

FIG. 18—QUOINS AT ANGLES OF HOUSE.

distance equal to the thickness of the crest-board when planed up. The shape shown in Fig. 14 is easily cut, and has the merit of being less likely to break than a cresting of a more ornamental character. It will be seen that this and the tiles are regulated in accordance with the plan adopted in determining the proportions of the dimensions of the house, each pattern in the crest-board and each tile being exactly *half* of the openings of the attic windows in width. The holes are pierced by aid of a stock and bit, and the surrounding star is in incised work. The method of doing this is shown in Fig. 15. When painted it is highly effective. I have recently used this kind of ornamentation, but far more elaborately, for the decoration of horizontal bands traversing a piece of trellis work which is a departure from the ordinary sharp chisel, the depth of the incision for each point of the star proceeding from nothing at the very apex to about half the thickness of the wood at the base. With a little practice, it will be found needful to do nothing more than to find the common centre of the concentric circles, describe the circles, and then to proceed with the incised work without delineating the points. The appearance of the crest-board may be still further improved by bevelling off the outer edge of the semi-circle to the extent indicated in the diagram, namely, half the radius of the smaller and inner circle, with the chisel. Fig. 16 is a representation of the pierced and incised work in the crest-board along the line A B. This will help to explain the nature of this part of the work, and how it is managed.

4. *The Parapet to the Roof.*—This is intended to

mask the ugly appearance that is presented by the roof not overhanging the sides and front of the structure. It would have been practicable to do this, but it would have been inconvenient and have led to the production of sharper corners than is exactly desirable in a toy of this kind, projecting in a very awkward manner at the angles of the house. The construction is simple, and is shown in Fig. 17. On the right of the figure, the construction of the attic window illustrated in Fig. 13 is shown on a scale of twice the size, and the various parts will be recognized on making a comparison of Figs. 13 and 17. The first step to be taken is to plane up some pieces about 1 inch square, supposing that the structure is made of ½ inch stuff, or ⅝ inch board planed down to this thickness. Three pieces will be required—one for the front and two for the sides. Mitre these pieces neatly at the corners, and fixing them with thin 1¼ inch screws, and before screwing up, sink holes with a narrow bit as shown at A, so that the screw-head may enter the wood and be buried about ⅜ inch from the outer surface of the slip. Make holes in alternation as shown by the dotted lines below the screw at B, so that the screws may alternately enter the horizontal roof-board C, and the vertical front-board D, and put the screws about two inches apart, so that the slip may be firmly attached to the house throughout its length. To the slips thus screwed up attach another slip of wood E, which may be ornamented by bradding on to the lower part a semicircular bead F, and running a groove G along the front, in the positions shown. Under the fillet A and the slip E thus attacked, some blocks as at H may be glued up. These may be cut from a piece of 1½ inch

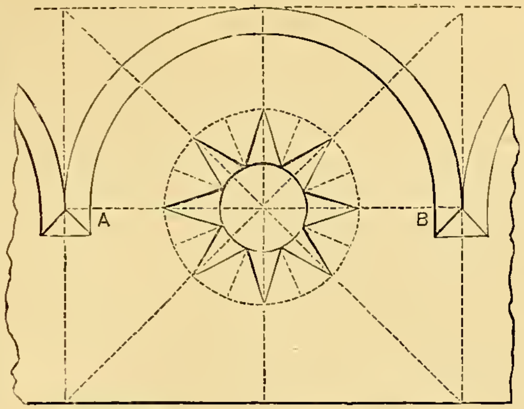


FIG. 15.—ORNAMENTATION OF CREST-BOARD.

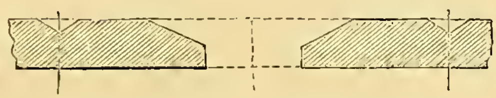


FIG. 16.—SECTION OF CREST-BOARD ALONG A B IN FIG. 15.

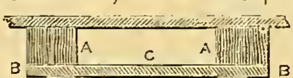


FIG. 21.—CHIMNEY-PIECE, PLAN.

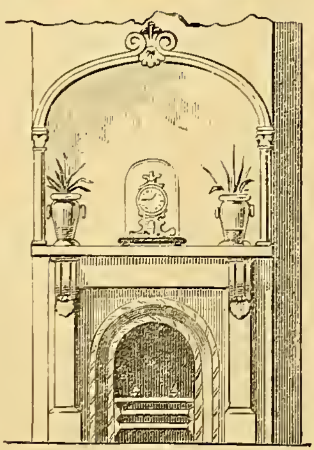


FIG. 20.—CHIMNEY PIECE, ELEVATION.

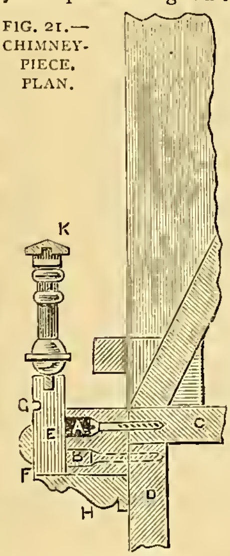


FIG. 17.—SECTION OF PARAPET.

moulding, and being put on as shown, afford imitations of cantilevers, used in building for the support of balconies and sometimes of widely projecting eaves. Holes may be bored along the upper edge of E, to receive the ends of small turned spindles; or, if preferred, a narrow slip of wood, a little wider than the upper edge of E, so as to project a little beyond it on either side, may be nailed and glued on to E, and in this may be made the holes for the reception of the lower ends of the spindles, the upper ends of which enter a cap K, which forms a suitable finish, and holds each spindle in its place. Those who prefer fretwork to turned work may substitute a slip of this for the spindles, but they must remember to cut a groove along the upper edge of the slip E and in the under side of the capping, which in this case may be a little thicker and slightly rebated on each side along its lower edges. A simple guilloche pattern would be suitable, but in this the makers must follow their own taste and liking.

5. *The Quoins.*—To add yet further to the ornamentation of the doll's house, it is desirable to add slips of wood at the corners, cut in such a way that they will present a good imitation of the dressings or quoins of a house in this position. The general effect and the method of managing them may be gathered from Figs. 3 and 4; but, perhaps, an additional illustration and a few words of description may be useful to many. Having determined the depth from the angle of the house to which the widest part of the quoining shall be carried, plane up six slips of wood—two for each angle at the front, and two for the edges of the sides adjacent to the back. These slips will now be rectangular in section, but the slips at the angles

in front must be mitred together as shown in Fig. 19, and the outer edges of each piece planed away at a bevel. Thus, if $\frac{3}{8}$ inch stuff be used for the quoining, $\frac{1}{4}$ inch may be bevelled away, leaving $\frac{1}{8}$ inch perpendicular to the sides of the house; or, if preferred, only half the thickness may be bevelled off. Now mark out the alternate pieces—one the whole width of the slip, and the other half the width, and in each remove the alternate pieces, which, when the slips are entire, are at C, D, E, F in Fig. 18, bringing it to the form of battlements. Having done this, fasten the slips to the sides of the house with glue and small wire nails, taking care that a short piece on one side has adjacent to it a long piece on the other, and so on throughout the whole length. Then take a fine tenon saw and make a cut between each block to the depth of the bevel on the outer edge of each slip, and then with a sharp chisel carefully bevel the edges of each block, as shown in Fig. 18. The dotted line in Fig. 19 represents the depth to which the saw cut should be made, and shows a section of the block on both sides of the angle of the house along the line A B. The dotted vertical line in Fig. 18 represents the edge of the sides of the house below the quoining. It must be borne in mind that the quoins at the edges of the sides adjacent to the back must not proceed beyond the plane of the back, but must be flush with it, as any projection beyond this plane would interfere with the opening of the house, as has been explained already. This completes the fittings outwardly, and I must now say a few words about the fittings inwardly; but in this I will be as brief as possible.

A room without a fireplace and grate would lose half its charm for a child, as without the mantelpiece there is no excuse for a pierglass, etc.; so it is desirable to provide for this, and in doing so we can manage to contrive "recesses," as the parts of a room on either side of the chimney breast are generally called. Before attempting to make these portions of the doll's house, it is better to purchase little grates for the rooms at the toy shops, and regulate the work to the size of the grates; but the way of going to work is in all cases the same. Having determined the width of the chimney breast, and, with this, the width of the recesses, one on either side, commence by screwing up two fillets to the side of the room, on the inside. These are represented in Fig. 21 at A, A Fig. 20 giving a general view of the elevation when complete, and when grate, mantelpiece, pierglass, and ornaments are duly placed in position. To the fillets A, A, which must extend from floor to ceiling in each room, the attics excepted, fasten a piece of board B B, completely covering the space between them. Here, then, we have the chimney breast and recesses. In the lower part of B B, at C, cut a hole, and fit the grate into it, and then surround the grate with the jambs, lintel, and shelf of a miniature mantelpiece; the plan of the jambs being shown at D, D. The cornice must be carried round the top of the chimney breast, and it will add to the appearance of the rooms if a thin piece of wood be carried round the bottom of each in imitation of a skirting board.

The house is now complete, externally and internally, and all that now remains to be done is to paint it. Perhaps the most effective way of doing this will be to paint the main part terra-cotta colour, with the quoins, dressings of the windows, chimney pots, etc., white, the tiles in red, and the parapet and cresting round the roof white; or, paint the house white, and the quoins, chimneys, dressings of windows, and parapet terra-cotta colour, and the roof in imitation of green and purple slate; but this must be left to the fancy of the builder. Again, whichever of these styles are adopted, all the parts which would be of wood in an actual house may be painted of another colour, or stained and varnished. The imitation of smoke *issuant* from the chimney—to use a heraldic phrase—as I have seen recommended in other instructions for building a very ordinary doll's house, had better not be attempted. It is possible to embellish the interior to the utmost by the addition of miniature blinds, which, if it be sought to imitate venetians, may be made of cardboard. Curtain poles to carry curtains are desirable.

With the furniture I have nothing to do. The house complete thus far will be ready for the incoming tenant, and the tenant usually brings his or her furniture, as the case may be. I promised at the commencement of these articles to give, in conclusion, an alternative method of building a doll's house; but, as they have run to a far greater length than I thought they would when I commenced, and as I have, I trust, fully redeemed the promise made to a correspondent in an early Part of this Magazine, I will defer this until it is demanded by anyone who wishes to build on another and a somewhat different plan.

HOW TO RABBET FRETWORK PICTURE FRAMES IN THE LATHE.

By OLLA PODRIDA.

THOSE of our "fretting" friends who possess, or have access to, lathes, may if they choose, considerably minimise the labour involved in rabbeting by hand the backs of picture frames for the reception of the mounts, etc. To many, without do , the cutting-out of the pattern affords the

greatest interest, and the after-work, such as rabbeting and polishing — polishing especially—isn't always very congenial. Polishing is—well, a sort of purgatory, haunted by spirits and a great deal of imperative manual labour. On the other hand, the labour attached to rabbeting may be greatly lessened. and the work executed in far better style, by the addition of a few tools to the amateur's "kit" for his lathe.

I am aware that those who possess means sufficient, generally content themselves by executing the sawing only, relegating the finishing-off to the cabinet-maker. I address myself to those who either can't afford this, or if they can, prefer going through the lot unassisted, and thereby lay claim to credit for a thorough job.

It is almost unnecessary to mention that there are methods of fixing photos, etc , in their frames, other than by rabbeting the backs, such as beadings and mouldings on the front, or ledges behind; but I think that all will share in my opinion that the rabbet is by far the neatest and most self-contained.

The tools and appliances which I would recommend as an addition to the "kit," and which I intend describing, are but few in number, and quite within the manufacturing scope of an interested amateur. I say "interested," because if a man concentrates his mind upon the achievement of a particular job, he will generally surmount the little obstacles which occur in the details of its progress. If the surmounting is not done gracefully, it will amount, no doubt, to a successful scramble, more or less to the satisfaction of the adventurer.

To accomplish the rabbeting with the assistance of a lathe, a tool is required as shown in Fig. 1. The sketch is drawn full size, but there is no stricture on the dimensions given, except that it is a very handy size for light work. The diameter across the blades of the cutter must be a little under that of the body of the tool, in order that the template, for guiding the tool when at work, may not be defaced. A better explanation of this will be offered further on. The tool may be fitted to the most convenient nose chuck at hand, or held in a drill chuck ; but a plain cylindrical one, as shown in Fig. 2, is much better, occupying less room, and, what is of more importance, presenting no irregularities, or projecting set-screws likely to form unpleasant acquaintance with the knuckles of the operator.

To make this tool :—Suppose we have a chuck all ready with a $\frac{7}{16}$ inch hole in it, then we get a piece of round bar steel, $\frac{1}{2}$ inch in diameter, of sufficient length so as to have a good hold in the chuck, and project about one inch; 2 inches long will be a good length for this sized tool. After being cut to the length, soften it by heating to a blood red, and burying in warm dry ashes till it cools. When cold enough to use, centre it truly, and turn it to fit the chuck. Make a good fit of this job, or else the result will be a "wobble" not very pleasant to deal with. File a flat on it, as shown in Fig. 1, for the set-screw to "take" on. Put it in the chuck, screw it up tight, and finish turning the "biting end." This is a truer way of dishing it up than between the centres. The part forming the blades, which must be slightly reduced under the body size of the tool, as we have already noted, must also be finished off with emery paper, in order that all scratches may be removed, as they would interfere with the cutting edges, they being formed by this part. Next drill a $\frac{1}{4}$ inch hole into the end, centrally for a depth of $\frac{3}{8}$ths of an inch. This will save labour in filing up the blades, and—files. Don't file up the blades *quite* sharp, as in tempering they will be very liable to get hot too quick and "burn," thereby spoiling the tool, and destroying the result of our labours.

Tempering a tool of this shape is not so easy as making it ; but yet not so difficult, if close attention mixed with obstinate perseverance and a good fire is used. If the amateur has a small forge, all the better ; if he has not, let him get up a good fire in the kitchen. Insert the body part of the tool first, and let it heat gradually towards the cutting end ; when it has become a dull red heat, turn it end for end, and very carefully heat the bladed part to a bright blood red ; immediately on attaining that colour, plunge it into olive oil, and allow it to cool. The oil must be at hand in sufficient quantity for the purpose. The blades will now be found to have assumed a whitish grey colour; this denotes a very hard temper, much too hard for use, it therefore must be reduced or "drawn down." In order to observe the transitions of colour effectually, during this process, the blades must be brightened with emery or sand-paper; this done, heat a piece of iron red-hot—a poker would do, but something larger is better—hold the tool close to it, turning it round so as to heat the blades equally, do not let the thin points come too close, or they will "come down" all at once and altogether, and cause a repetition of the oil business. The best way is to let the tool rest on the shoulder part, with the blades up at a good angle from the hot iron, and regularly turn now one blade and then the other towards the heat as they change in colour from the whitish grey to pale straw, so on to dark straw, and the colour of a "fly's wing," down to pale blue, at which stage it must immediately be arrested by immersion in *clean* cold water. The reason for this low temper, viz., pale blue, is that it admits easily of "fettling" up to a sharp edge, and is less liable to break, a great con-

sideration in a tool of this sort. The cutting edges may now be finished. First bring them to sharpness by means of a fine saw file, applying it to the inside only. Do not touch the outside of the blades, that's all right and can't be bettered. Finish off to a keen edge with a thin Turkey slip. The rabbeting tool is now ready for action.

The mode of preparing the tool for rounding off the edge on the face of the frame is the same as for the one which I have just described, except in the detail of forming the cutting part, where it is first turned down to $\frac{1}{4}$ inch diameter, as shown in Fig. 3, and a line drawn carefully through the centre across the small end, as a guide for filing up. It is then brought into shape with a half round file, and the cutting edges rounded out, and bevelled to follow each other, like a common drill. The process of tempering and the temper is precisely the same as for the rabbeting tool.

Having described the manufacture of the tools, the next thing that demands attention is an appliance for guiding the tools to the outline of the required opening. These are of various forms, but chiefly elliptical, or rectangular with the upper corners *rounded.* A neat form is given in Fig. 4, a sort of Cupid's bow at the top. Let us take the ellipse in illustration. To make the guide or template, get two pieces of hard wood, of such a size as will suit the largest frame in contemplation, and within the scope of a lathe. It may not be out of place to mention here that the lathe heads may be raised to meet an exigency, packing blocks, of wood, are used, and a lathe, say with 4 inch centres, may be raised 2 or $2\frac{1}{2}$ inches without getting appreciably shaky on its pins, on work of this class. Returning to the subject, gauge and plane these two pieces of wood to a thickness of $\frac{5}{8}$ths of an inch. Square the edges, keeping them both exactly the same size. In shape they may be rectangular or square, but the former is the best. Screw them together face to face, and on one side draw two centre lines for the transverse and conjugate diameters of the required ellipse. Describe this $\frac{7}{16}$ths of an inch larger than the given opening in the pattern; this gives $\frac{7}{32}$nds of an inch all round, being the allowance for the semi-diameter of the tool, and the width of the rabbet when finished. Having marked the ellipse, cut it out right through both pieces, following the marks and carefully squaring the sides as you proceed. Finish out smooth and fair with glass-paper.

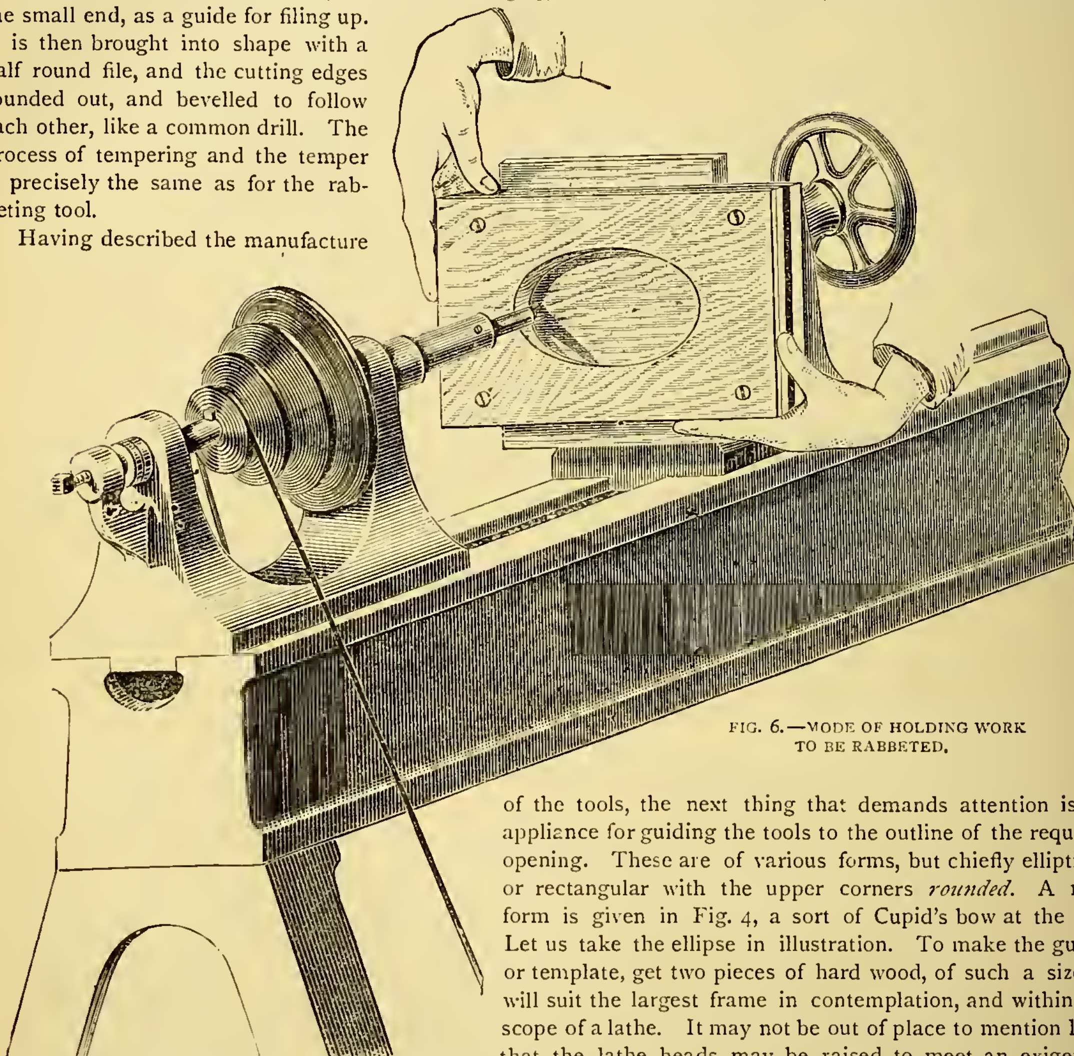


FIG. 6.—MODE OF HOLDING WORK TO BE RABBETED.

We next require some means of keeping the work in its proper relation to the tool, and of advancing it

as required. To meet this, the "poppit" head must be employed, and a kind of face plate or table fitted on the end of the sliding cylinder. Those who possess a rest for drilling work against, can get over this by screwing a wooden face to it about the same size as the template. Those who haven't one, can make one of wood as follows : Bore out a piece of hard wood to fit the cylinder tightly, and screw the table on to it, covering the hole so that the thrust of the cylinder may be taken in advancing the work. Fig. 5, an elevation and sectional sketch, will, at a glance, fully explain this arrangement.

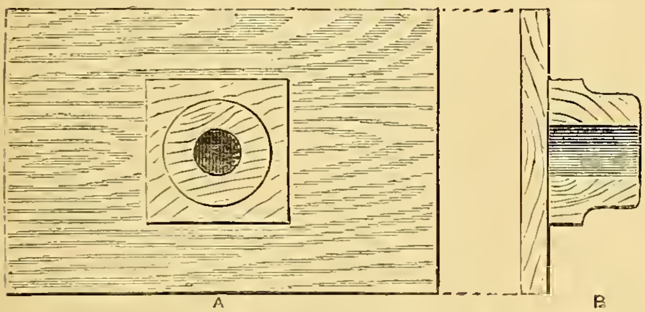


FIG. 5.—FACE PLATE TO BE FITTED ON END OF SLIDING CYLINDER. A, ELEVATION ; B, SECTIONAL SKETCH.

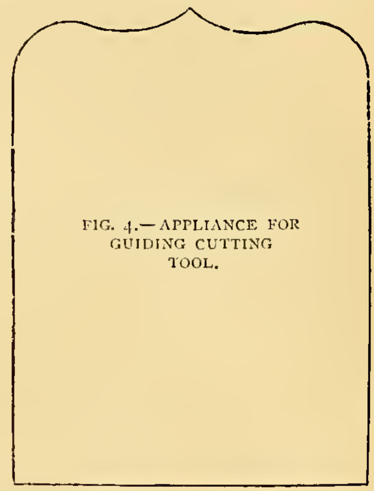


FIG. 4.—APPLIANCE FOR GUIDING CUTTING TOOL.

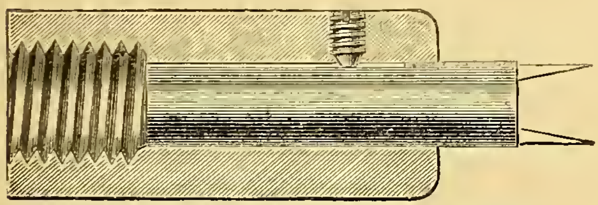


FIG. 1.—TOOL FOR RABBETING IN LATHE. FULL SIZE.

FIG. 2.—PLAIN CYLINDRICAL DRILL CHUCK.

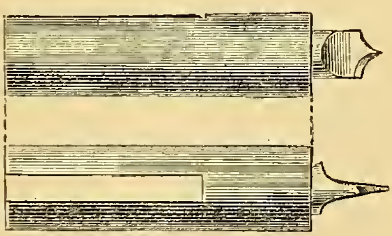


FIG. 3.—CUTTING TOOL FOR ROUNDING OFF EDGE ON FACE OF FRAME.

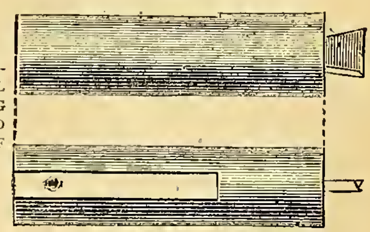


FIG. 7.—DOVETAILING TOOL FOR CONNECTING SUPPORTS AND SHELVES OF BRACKETS, ETC.

Having described the preparation of the necessary tools and appliances for doing the picture frame business, I will now endeavour to illustrate their use. Suppose we have a frame ready to be operated upon. Put it between the templates, and screw them together tightly, thus clamping, as it were, the frame between. Four stout $1\frac{1}{2}$ inch wood screws will do this nicely ; they must be got in either at the corners, clear of the frame, or else through convenient places in the pattern. In screwing up, see that the two parts of the template are kept fair and square with each other, this may be done with a square applied on the side across the edges ; also see that the template agrees with the pattern. Now the importance of the halves of the template being true with each other will be appreciated ; if they are not, the front and back of the frame, when finished, will not agree. After being satisfied that all is correct, fix the rabbeting tool in the chuck, allowing it to project the thickness of one side of the template, plus the depth required to be rabbeted; this in the case of a frame $\frac{5}{16}$ths of an inch thick, would be about $\frac{3}{16}$ths, and allowing $\frac{5}{8}$ths as the template thickness, a total projection of $\frac{13}{16}$ths would be requisite. Rig up the table on the end of the poppit cylinder, and start the lathe, holding the work firmly against the table, and the body of the tool following round the template, and advancing the work until the depth is attained. One heavy cut and

a light one for finish, or even one cut will be sufficient. After finishing the back, change tools, putting in the rounding, and parting off one for the face. Go through a similar performance, until the centre drops out, and the opening is complete. The higher the lathe speed used the better finish. A general illustration of the *modus operandi* is given by Fig. 6. If the frame is to contain more than one photo, shift the template from one to other in the same manner, and repeat the process. The quality of the work executed will be found highly satisfactory, and a long way ahead that produced by hand router, or "old woman's tooth," as termed by some.

Fig. 7 shows a dovetailing tool, which will be found very useful in connecting the supports and shelves of brackets and other work where screws would be unsightly or impracticable. The guide for this tool consists of two parallel strips of wood about 3 inches wide, by ⅝ths inch thick, with a couple of screws at each end for clamping the shelf in position. The male part of the dovetail is readily prepared by running a sharp gauge set to the depth, along the edges of the support, and cleaning out the angles with a firmer, or flat, chisel. All that has been said as to the making and tempering of the other tools applies equally to this one.

Should any of my readers feel disposed to adapt their lathes for the purposes mentioned, they will find themselves amply rewarded in speed and quality of execution. I have endeavoured to make everything as clear as possible; but should any further explanation be required, I shall be most happy to give it.

BOOTS AND SHOES:

HOW TO MAKE THEM AND MEND THEM.

By ABEL EARNSHAW.

VIII.—BOOT REPAIRING—REPAIRS OF RIVETED BOOTS.

AFTER a long interval of silence, caused by circumstances beyond my control, I am pleased to be able to resume my explanations of the processes of the shoemaker's handicraft. My previous articles, I am glad to learn, have been so far successful that several readers have written stating that, having carefully followed the instructions that were given, they have been enabled to make boots for themselves, which not only satisfied them on the score of economy, but in point of appearance also. But, if some correspondents have thanked me for the knowledge I have been able to impart, I have not escaped blame for my want of knowledge either, inasmuch as a Cheltenham correspondent has, in a letter of six pages, explained to me that I know nothing about the conformation of the foot, and has begged me to abandon my views as to the desirability of making boots right and left shapes, before I cripple the people of this country more than the members of my craft have yet crippled them. In place of my sole shape given in Part II., as being the medium between the fashionable and the altogether ungraceful sole forms adopted by some so-called anatomical bootmakers, this correspondent sends me a drawing of the sole shape he thinks would enable people to walk with ease. This is nearly, if not exactly, the same shape as the back of a housemaid's scrubbing brush, and provides for feet as though the feet themselves were alike on both sides, and interchangeable. I instance this in order to show those who may read these articles that the shoemakers are not entirely to blame for the folly which is so noticeable in the shapes of modern boots and shoes, for doubtless, when the correspondent referred to has boots made for his own wear, his shoemaker is afterwards blamed for the queer looking work turned out.

But this article was to deal with boot-repairing, and not with bootmaking. I shall probably most facilitate the work of the amateur by following the order of the bootmaking articles, and explaining in this chapter how to repair riveted boots, and that class of goods—now the bulk of the cheaper sewn boots worn—those sewn by machine with a single seam direct from the outside or bottom of the sole to the inside or inner sole. Machine-sewn boots *can* be repaired by machine sewing, but as this involves the use of a machine which the amateur can by no means avail himself of, it may here be said that the only practical way of repairing is by riveting or pegging them.

In regard to the choice of leather for mending, one or two words of advice may be given. As a rule for light work, the amateur will find it best to ask for and use English leather. The soles he buys should be firm, but not harsh in feel, and an examination of the edges should show that the fibre is close and not porous to any apparent extent. Good English leather can always be recognized by the pleasant oak bark-like smell. For heavier work a mixed tannage answers—Evans' Bristol leather being the best produced for the purpose. Leather for repairing boots which are to be studded with nails needs not to be of so good quality, for if it is very hard the heads of the nails are apt to break off in wear. Top-pieces, that is to say the layers of leather on the heel which comes next the ground, should always be stout and of good quality. The cost of light English soles, or half soles, as those for repairing are more properly termed, will be, for men's sizes, from 1s. to 1s. 6d., according to size and quality; the heavier kinds vary from 1s. 4d. to 2s. 6d.,

the latter price being for soles of exceptional size and weight. Top-pieces will cost from 4d. to 6d. if good.

The work which most frequently needs to be done in the way of repairs is the renewal of the soles and heels. To effect this purpose it is necessary, first, that the boots should be put on the iron lasts and be thoroughly filled out by them, so that there is no slipping about while the work is being done. If the boot slips at all during the process of repairing, or the sole springs up and down while it is being hammered, etc., the probability is that the work will not be "solid," to use the trade expression, meaning that it will not endure. The iron last having been inserted by being first placed upon the upright stand and the boot drawn over it. The boot containing the last may then be placed in its natural position on the bench, and the instep block inserted and pushed down. This, if properly done, will make it impossible for any slipping to take place. Having replaced the boot and last upon the upright stand, the first thing to be done is to clear away any wholly or partially decayed leather, and to level the bottom of the boot preparatory to the new layer of leather being added. This levelling is in boot repairing to a very great extent the secret of successful work; and the reason that so many of the cheap repairing shops that may be seen in almost every thoroughfare, do such clumsy and moreover flimsy repairing is that sufficient time is not spent in getting the work levelled before the actual repairing commences. I have, in writing of bootmaking, dwelt at length upon the necessity of the careful preparation of material; in repairing this is doubly necessary, as both the old leather and the new are somewhat uneven to begin with.

If the boots are light, it is usually best to remove the old sole altogether from the toe to the top part of the waist, leaving the middle sole or welt undisturbed. To do this with a riveted boot it will be necessary to insert between the old leather of the sole and the middle sole a screwdriver, or other similar blunt instrument, when by the application of a little leverage the sole will separate, and it may then be cut off with the knife. The rivets near the point of separation will need to be removed; these can either be withdrawn by the aid of the pincers, or, when they have been raised away from the upper, may be punched through the sole, a piece of waste leather being placed beneath between sole and upper to prevent injury to the boot. When these rivets have been taken out, the free end of the old sole should be "skived" carefully down, a portion, about three-quarters of an inch, being so prepared to go underneath the new sole. As the old leather is somewhat difficult to pare down rasping with a small rough rasp will be found a good plan for getting the requisite evenness of surface. The sole should have a small groove or "rabbet" cut just where the end of the new sole is to fall, so that when the leather has been carefully "skived" on its under side, so that its bevel corresponds with that of the sole, the two ends will make a level and even juncture. The old sole may now be riveted down again, and the new sole, which I am presuming to have been wetted, allowed to "mellow," and hammered, after the manner that has before been recommended in the chapters on bootmaking, may be tacked down in its proper position at this joint, and with one or two rivets here and there about the forepart. Then it should be gently hammered and "sleeked" or rubbed down with the "long stick."

It has now to be rounded or pared to the shape of the forepart of the boot, with the knife. Rounding or paring is an operation needing to be performed with a considerable amount of care. The less expert the workman is, the more leather he, in attempting to round up the sole, should leave upon the edge, inasmuch as he is somewhat apt to be mistaken as to the closeness of his work. While it is very easy, if when the work is finished, it is found that too much leather has been left on, to pare it off, on the other hand, a deficiency cannot be made up, and spoils both the appearance of the work and its comfort and durability. The sole having been rounded, a row of holes should be made all the way round, except at the joint with the old sole, at the distance of $\frac{3}{8}$ inch from the edge, and the rivets driven in to hold it down. The rivets which fasten the old and new sole together at the joint should be put in close to the edge, and if this is done neatly, a joint will be made that will never separate, nor scarcely show when the boot is on the foot. In regard to the length of the rivets to be used, a little care is necessary. As a rule, for an ordinary walking boot, $\frac{9}{16}$ inch rivets will be long enough to go through and hold firmly round the forepart. If the rivets are too long, the work is no more secure than if too short: they should just touch the inside, and no more.

When the sole is properly riveted on, it may be given another gentle hammering, and a vigorous sleeking with the long-stick. Most amateurs are apt to suppose that it is by hammering that the sole is made durable in wear; but I would advise them, after the first hammering (which has been given before the sole is put on), to trust rather to the "long-stick," which cannot injure, than the hammer, which may damage the foundations of the boot. In "sleeking out," or hardening the leather with the long-stick, the best way is to throw a few drops of water upon the bottom of the sole after the gentle hammering has levelled any slight inequalities that may have appeared, and then to rub backwards and forwards

vigorously with the stick for a minute or two. This rubbing "scours" the sole, and brings out from it any dirty matter which it may contain, besides thoroughly bedding it down to the shape of the bottom of the last. The dirty water should now be wiped off, and the sole allowed to dry for a few minutes at an open window. Then, if it is rubbed again with a dry cloth, and afterwards with the long-stick, it will thoroughly harden and assume a brilliant natural polish quite as satisfactory in appearance as any finish that could be given by removing the grain of the leather, and showing the fibre beneath.

There is another method of soling boots, by means of outside clumps. This plan increases the thickness of the sole considerably, the old sole being left on altogether, irregularities in its thickness being made up by overlays. In describing the making of clumped boots in Part III., I have explained at length how outside clumps are put on ; and this applies to mending, equally with new work. Too much care cannot be taken in preparing the old sole and making it even. This is the only additional instruction necessary.

Heeling is a very simple process. The heels being, as the reader will understand, composed of regular layers of leather or "lifts," it is only necessary to get an even base by removing, by means of an old chisel, the layers which have been worn through. Half-lifts may be used to a certain extent ; but if the work is to look well, it is better to use a little more leather than to run the risk of making a bungle, such as the half-lifts will most probably cause. I have explained above that the secret of good work in soling is the preparation of the old surface to begin with. So it is in regard to the heels. If the base is not an even one, it may be made so by the addition of small pieces of leather, each one "skived" or bevelled, so as to make a plane surface ; afterwards the whole lifts may be piled one upon another until the required height is reached, then riveted down with iron heel rivets, and the top piece added when the heel is ready for paring off.

It will be unnecessary to repeat the instructions as to finishing, the process being practically the same as described in the articles relating to bootmaking in Part IV. Indeed, all the operations mentioned in this chapter will be better understood if reference is made to the very complete instructions which Parts II., III., and IV. contain.

Another operation which the boot-repairer has frequently to undertake, and which can be performed by the amateur with ease, is under or overlaying—*i.e.*, piecing the toe or side. If the sole is fairly good, except at one point where it is nearly or quite worn through, it is the best, and certainly the neatest plan, to repair it by underlaying. For this purpose a piece of butt leather is taken and cut to the shape of the worn portion, but left considerably larger, the size varying according to circumstances. The rivets are taken out of the sole, or cut in two with a chisel, and the piece, which has previously been carefully bevelled away at the edges, except on the outer one, is thrust under. By this device the full substance of the sole is made up at the worn part. The thinnest portion of the old sole is then cut away, and at a short distance from its edge a row of rivets are inserted, which hold it fast.

Overlaying differs but slightly from this, and consists in adding the new piece to the outside of, instead of beneath, the old sole. This plan should be adopted when the sole is worn very much, for it will not then hold the rivets, the heads of which come through. The overlay is "skived" and prepared in the same manner as the underlay, except that its edge has to be left a little thicker, so that the tendency to curl or become ragged in wear may be avoided.

(*To be continued.*)

A CARTRIDGE MAGAZINE AND GUN IMPLEMENT CASE.

By B—— G——.

THE accompanying sketches represent the details of a Cartridge Magazine (Fig. 1) capable of holding 400 No. 12 C. F. cartridges, with a tray overhead (Fig. 2) divided into compartments for the various implements used in cleaning a gun, or for loading cartridges. Each tool consequently has a separate division for itself, and is therefore always at hand when required. The inside measurements of the case are as follows: Length, 17 inches; breadth, 11 inches; height, $7\frac{1}{2}$ inches. The lower part of the case is divided into four equal parts, each capable of holding 100 cartridges; or 400 in all. I will now explain the method of forming the partitions. A groove is cut in the inside of each side and end, $4\frac{1}{4}$ inches long and $\frac{1}{4}$ inch wide, and of the same depth. These grooves are made to receive the partitions A and B (Fig. 3), which are $16\frac{1}{2}$ inches by $4\frac{1}{4}$ inches by $\frac{1}{4}$ inch, and $11\frac{1}{2}$ inches by $4\frac{1}{4}$ inches by $\frac{1}{4}$ inch respectively. The reason for making the grooves and height of partitions $4\frac{1}{4}$ inches is, that five cartridge cases, resting lengthways on each other, measure a shadow under $4\frac{1}{4}$ inches. Ten cartridges lying side by side measure less, by a small amount of space, than $8\frac{5}{8}$ inches, and two cartridges placed end to end, when loaded, measure not quite $5\frac{5}{8}$ inches. The above explanation shows

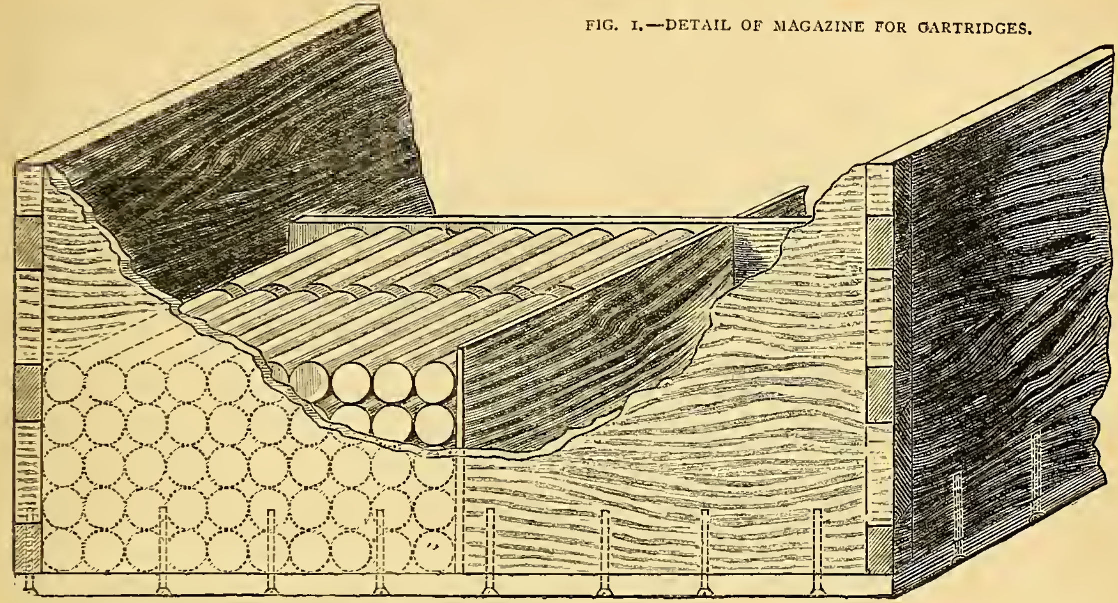


FIG. 1.—DETAIL OF MAGAZINE FOR CARTRIDGES.

the reason for making the divisions of the size laid down. In Fig. 3, A represents the longer partition, B the shorter, and each has a slot $2\frac{1}{8}$ inches by $\frac{1}{4}$ inch cut in the centre, so as to allow them to key into each other at right angles. When the sides and ends of the case have been joined, A is dropped into the grooves cut in the short sides; B follows, fitting into the other grooves, and is gently hammered down until it is home. The bottom can then be nailed down. In Fig. 1, one part of the magazine is shown containing 100 cartridges, in 10 rows of 10 each. The tray, which rests on the partitions already described, is

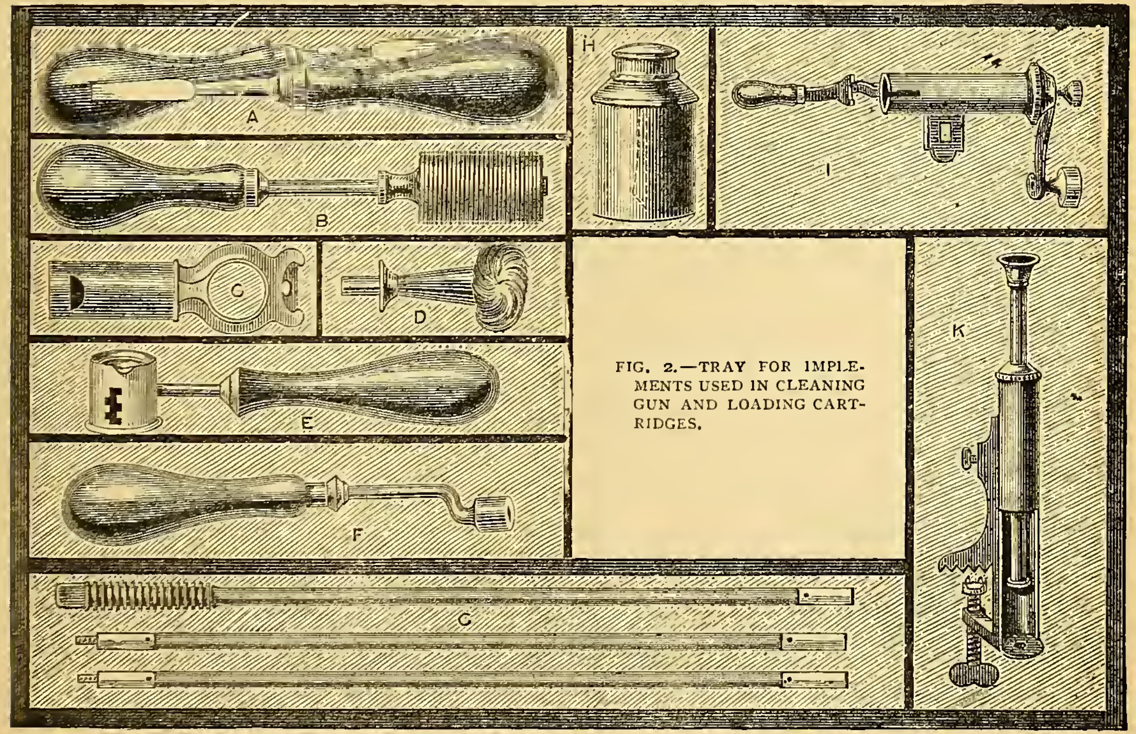


FIG. 2.—TRAY FOR IMPLEMENTS USED IN CLEANING GUN AND LOADING CARTRIDGES.

divided by thin pieces of wood in the manner shown in Fig. 3. A, B, E, and F are each 8 inches by $1\frac{1}{2}$ inch. C and D are equal in size. G is 13 inches by 2 inches. H is $2\frac{5}{8}$ inches by 2 inches. The loading machine, having been taken asunder, fits into I and K, which are 6 inches by $2\frac{5}{8}$ inches, and 7 inches by 3 inches respectively. The vacant space to the right of the centre of the tray in Fig. 2 can be further divided for other tools, or left its full size for rags, etc., at the option of the amateur. The sides of the tray are 3 inches deep, and are raised by means of two flush brass handles, or drawer lifts, such as are supplied by Messrs. Melhuish and Sons, 85-87, *Fetter Lane, E.C.*

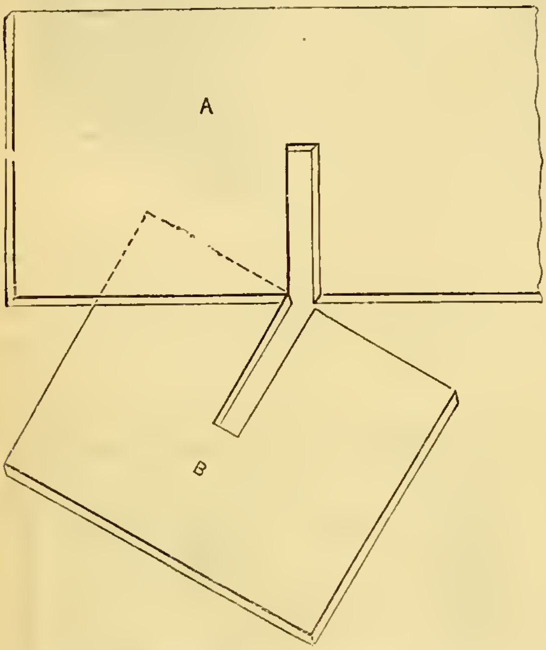


FIG. 3.—DIAGRAM SHOWING THE METHOD OF MAKING THE PARTITIONS IN LOWER PART OF CARTRIDGE CASE.

The size of tray partitions given above suit the various tools in my gun-case, but can, of course, be changed so as to suit all sizes. The magazine can also be constructed to hold a greater or less number of cartridges, if necessary. Two iron or brass handles sheuld be placed one on each end of the box to lift it by, when putting the case into a dog-cart, etc., etc. A lock and key completes what I have found to be a very useful shooting companion.

As the time for the annual slaughter of grouse is close at hand, and sportsmen are even now looking forward with keen pleasure to the time when they may work their will unhindered on partridges and pheasants, it is hoped that the manufacture of the case described above will afford some of them congenial occupation in the interim.

ORGAN BUILDING FOR AMATEURS.

By MARK WICKS.

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VII.—THE PEDAL ORGAN: SOUND-BOARD, AND PEDAL KEYBOARD.

WE now approach the consideration of a portion of the instrument which, in many works purporting to instruct the amateur, is either treated in a vague manner or omitted altogether. I allude to the arrangement of the pedal organ and the action connected therewith; and I trust that the instructiens which I now give, and the copious illustrations with which they are accompanied, will enable amateurs to select the arrangement that happens to be best suited to the means and space at their disposal, and that they may be enabled, by the help of instructions and illustrations combined, to carry out the work in a satisfactory manner.

The first point to be considered, is, how do we wish the pedal pipes to be arranged? In many cases the answer to this question must depend on the space at the disposal of the amateur. It may be that we have plenty of room to spare both at the sides and at the back of the organ; and, if so, we may very effectively bring the six largest pedal pipes to the front, and arrange three on each side of the keyboard, and the remainder would be placed at the sides, and, also, at the back of the organ, if necessary, as shown in Fig. 87. In the case of the two-manual instrument none would need to be placed at the back, as there would be plenty of room at the sides. In Fig. 88 all the larger pipes are shown arranged at the back, and the smaller ones at the sides, none being brought to the front, thus saving a little in the depth of the instrument. Fig. 89 shows all the pipes arranged on a single sound-board at the back of the organ; and, as I anticipate that this plan will be adopted by many of my readers on account of its compactness and simplicity of action, I have set it out on a larger scale, so that a study of this plan will also enable the amateur to more readily understand the other systems mentioned. Another good arrangement which, moreover, is so simple that I have not thought it necessary to give an illustration of it, is to suppose this last sound-board to be cut in half, crosswise, placing one-half on each side of the organ, having twelve pipes on one side and thirteen pipes on the other. This arrangement, as will be readily seen by anyone who will take the trouble to put it on paper, is a very good one for the two manual, as the depth of the organ is sufficient to allow the pipes to be all placed at the sides.

The pedal sound-boards are made much in the same way as the manual sound-boards, but are much

simpler, as in our small organs there will be only one stop on the pedals; consequently no sliders, or upper-boards, will be required. Fig. 90 shows the ordinary style of pedal sound-board, the channels being made 6 or 7 inches long in the clear, and 2 inches deep. The widths of the channels vary from about $1\frac{1}{2}$ inch for CCC, to about $\frac{7}{8}$ inch for C. The wind-chest should be 4 inches deep. The top board, or table of the sound-board, should be about an inch thick, if no grooves are required, but if any of the pipes are grooved off, either a separate grooving-board must be used, or the table must be made thicker, in order that the grooves may be cut deep enough to convey the requisite supply of wind. As a rule separate grooving-boards are the best for this purpose. The amateur organ-builder must bear in mind that one of the sides of the wind-chest must be made moveable in the same manner as in the manual sound-board, in order to get at the pallets if required. The pallets should be made exactly the same as the others, but a rather stouter spring should be used, and the pull-downs should pass through holes in a strip of brass.

The holes for the pipes to stand over should be bored in the same way as described for the bass pipes, viz., by boring two holes side by side, and cutting away the intervening wood to form one oblong hole. The pipe feet do not stand in these holes, but in a speaking block, which is merely a circular piece of wood about $1\frac{1}{2}$ or 2 inches thick, having a circular hole at the top to receive the pipe foot, the hole being sloped out on the under side to correspond with the shape of the hole in the sound-board; this block should be glued on to the table. The action works under the wind-chest, so care must be taken that the sound-board be raised sufficiently from the floor to admit of this.

Another method of making the sound-board is shown in Fig. 91, which is very much the same as the preceding one turned on its side. This sound-board stands on the floor, and thus saves a few inches in the height of the instrument, and, as either side of it may be turned towards the action, a pull or a push action may be used, according to the movement that may be required. In the plan, Fig. 87, the sound-boards are shown as being returned both at the back and at the front; but this is not really necessary, as they may be simply straight sound-boards extending the whole depth of the sides, and those pipes which are placed at the back and front may stand on a grooving-board instead of being exactly over their channels. If this method is adopted the sound-boards will be much easier to make, and the action will be much simpler, as only one kind would be required. The same course might be followed in carrying out the arrangement shown in Fig. 88, where the sound-board might extend only along the back, the pipes at the sides being planted off. The sound-board would then be divided into twenty-five channels, as in Fig. 89, the largest pipes being placed near to the back edge, and the front part left clear for the grooves, or conveyance tubes. I may say that if this plan be not adopted it will still be necessary to put double divisions to all the channels unless very thick wood is used for the purpose, which is not by any means advisable, so that in reality there would be no extra labour involved by making use of the channels thus formed.

I have allowed fully for the size of the pipes on these sound-boards, so that it is very probable, especially in the case of the style in Fig. 89, that you may not require them quite so long. The pipes may be placed so that the sides come close together, but should not touch each other. Make your pipes before you make the sound-board, and, if they are circular pipes, all you will have to do will be to strike circles the size of the extreme outside diameter of the pipes, and mark them on the sound-board table side by side, and you will then see exactly how much space you require for them to stand in. With wood pipes you should cut out a square of paper or card the exact size of each pipe, and place it on the sound-board table, and mark round it in pencil. The sound-board in Fig. 89 should be 12 inches wide, and I have shown it 6 feet 3 inches long; but, as stated above, it may not be necessary to make it quite so long. If the pipes are placed near the edges, as I have shown in the illustration, and with the mouths of the two rows facing towards each other, there will be plenty of speaking room.

Having completed the sound-boards, the wind-trunks may be next prepared; they should be of $\frac{1}{2}$-inch stuff, and measure about 5 inches by $2\frac{1}{2}$ inches internal diameter. As stated in a previous chapter, they may be placed either at the ends or at the back of the bellews, as may be most convenient; but in most instruments the best plan is to place them at the back, and to allow the wind to enter the pedal wind-chest at the extreme end. A section of the wind-trunk is given in Fig. 92, from which it will be seen that the wind enters from the bellows at the upper part B, and passes into the wind-chest at the lower part C, a flange plate being used at either end to connect the wind-trunk to the bellows and to the wind-chest.

In order to save unnecessary labour in blowing when the pedals are not required, it is usual to have a valve, worked by a stop-knob, to shut off the wind from the pedal wind-chest. This valve is shown in the section, and is opened or closed by the stop-knob acting on the upper arm of the roller—the arms marked

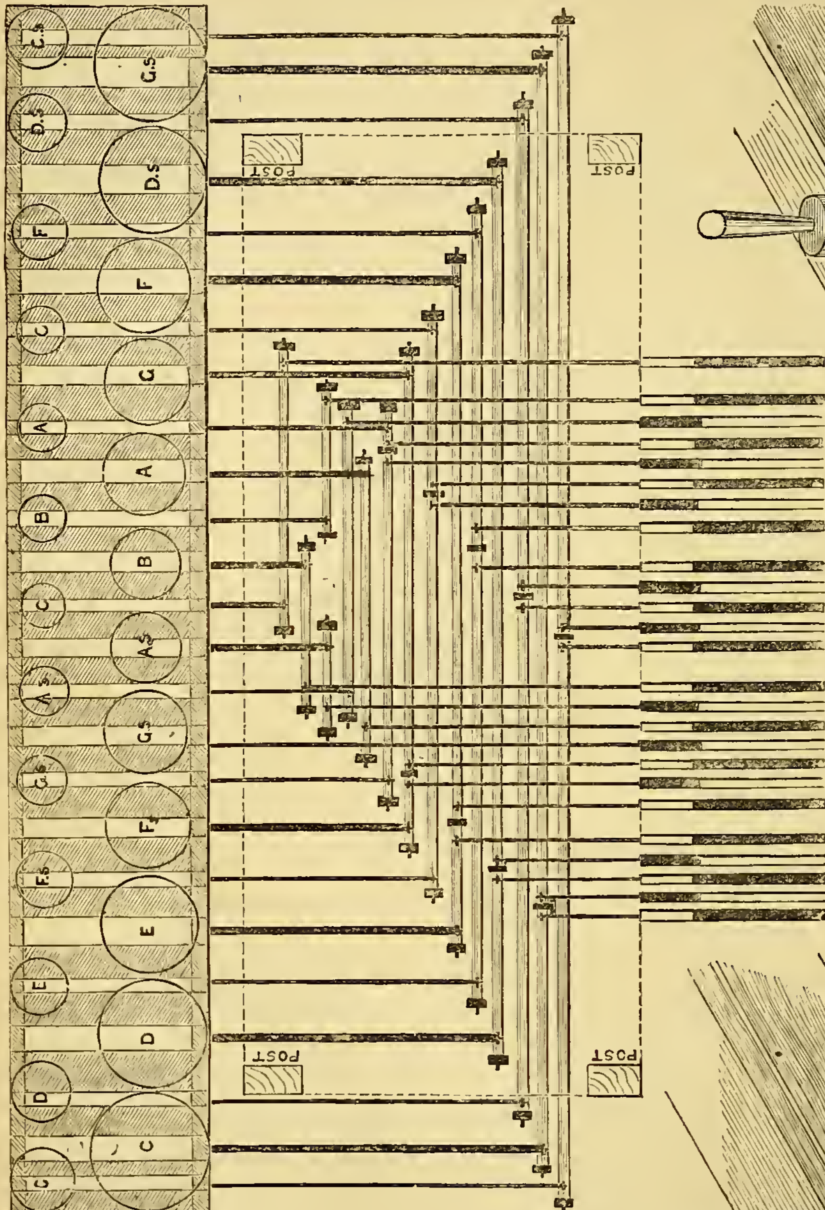


FIG. 89.—PEDAL ACTION, No. 3. Scale, 1 in. to a foot.

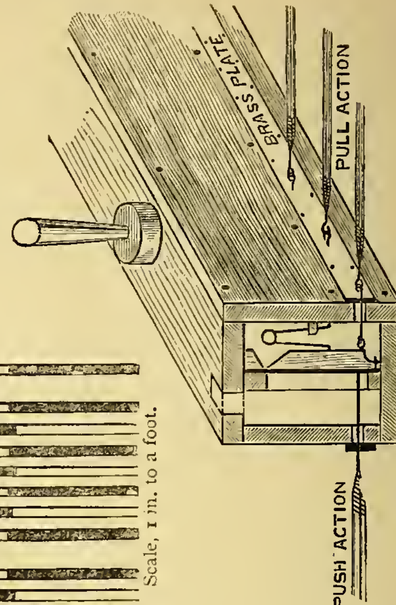
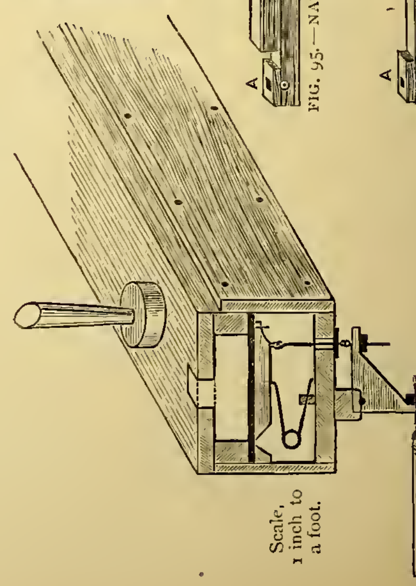


FIG. 91.—PEDAL SOUND BOARD, ETC. Scale, 1 inch to a foot.

FIG. 95.—NATURAL PEDAL KEY. Scale, 1 in. to foot.

FIG. 96.—SHARP PEDAL KEY. Scale, 1 in. to foot.



Scale, 1 inch to a foot.

FIG. 90.—PEDAL WIND CHEST AND SOUND BOARD.

FIG. 97.—SECTION OF PEDAL KEYBOARD. Scale, 1 inch to a foot.

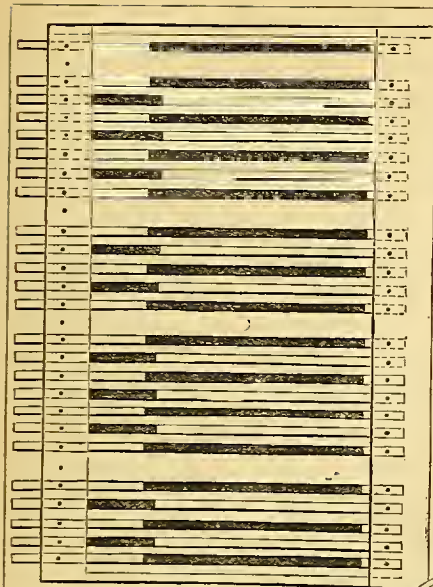


FIG. 93.—PLAN OF STRAIGHT PEDALS. Scale, 1 inch to a foot.

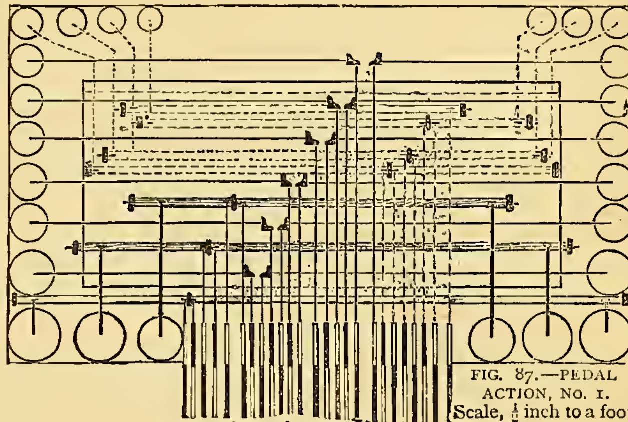


FIG. 87.—PEDAL ACTION, No. 1. Scale, $\frac{1}{2}$ inch to a foot.

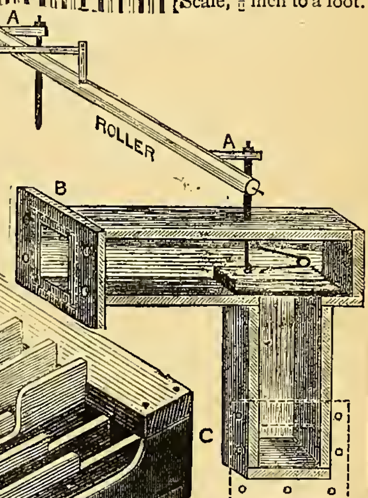


FIG. 92.—PEDAL WIND-TRUNK.

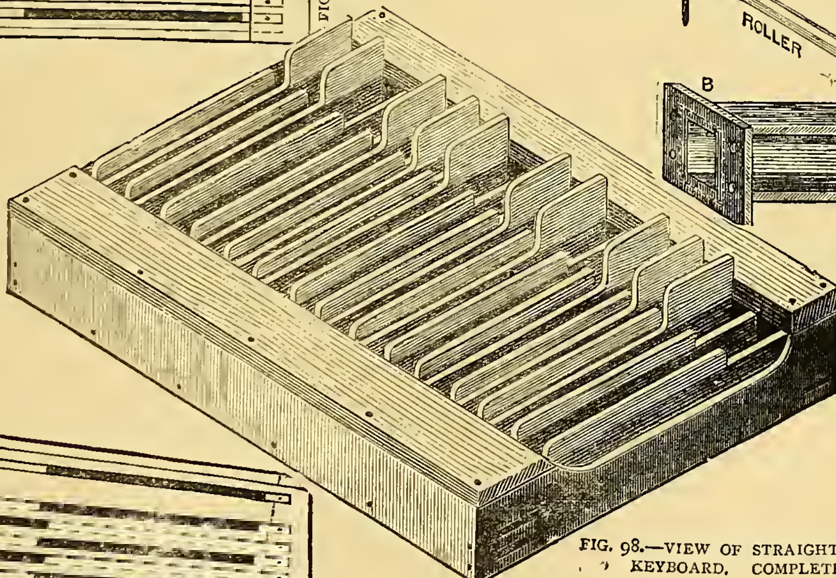


FIG. 98.—VIEW OF STRAIGHT PEDAL KEYBOARD, COMPLETE.

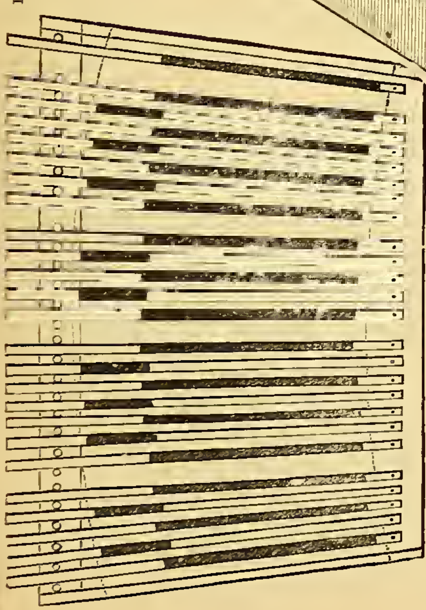


FIG. 94.—PLAN OF RADIATING PEDALS. Scale, 1 inch to a foot.

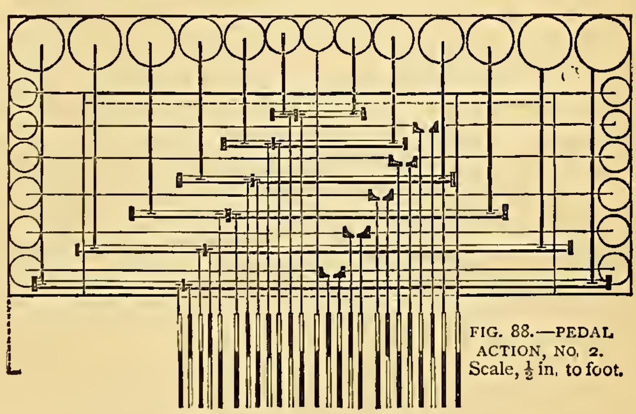


FIG. 88.—PEDAL ACTION, No. 2. Scale, $\frac{1}{2}$ in. to foot.

A at each end being connected by a tracker to the pallet or valve in the wind-trunks, if there are two; but, of course, if there is only one wind-trunk, only one arm and tracker will be required.

Now to construct the pedal keyboard. First prepare the front and back cills, each 3 feet long and $3\frac{1}{2}$ inches wide; the front one $2\frac{1}{4}$ inches thick, and the back one $1\frac{1}{2}$ inch thick. These may be of oak or pine; the sides may be of $\frac{3}{4}$ inch pine, 2 feet long and 5 inches deep, cut out as shown in Fig. 98, the cills being firmly mortised into them. Draw a line, or gauge mark, along the centre of the whole length of each cill, and divide each line into thirty equal parts with the compasses, starting from the outside edge of the frame, thus making each division rather more than $1\frac{3}{16}$ inch. Some prefer the divisions to be rather more than this, so if you like, you may make the cills a trifle over 3 feet long, and divide accordingly. Now draw a line across the cills through each point, and drive a stout wire pin into all the points except the 6th, 14th, 20th, and 28th. These blank spaces are those shown between E and F and between B and C in each octave, there being no sharp keys between those notes. The front row of pins should show $1\frac{1}{4}$ inch above the cill, and the back row 4 inches. I may say that I term the cill farthest from the organ the front, and that which is nearest the casing the back one, as I think this nomenclature is less likely to confuse the amateur than the ordinary one, in which the order is reversed.

Now get out twenty-five pieces of good sound pine fully 1 inch deep, about $\frac{7}{8}$ inch thick and 2 feet long, for the pedal keys. Bore a vertical hole carefully through one end of each bar, so that it will just slip easily on to the front row of pins, and mark where the back pin comes, and bore holes in the bars for them, elongating them on the under side; these holes must be bushed with cloth. Now get out twenty-five pieces of mahogany or birch about $1\frac{1}{2}$ inch long and $\frac{3}{4}$ inch thick, and glue and screw one over the front hole in each bar, as shown at A in Figs. 95 and 96. When dry, bore a hole $\frac{3}{8}$ inch diameter through the side of the key, so that it passes through the vertical hole, and the top of it just touching the under side of the piece A; the object being to prevent unnecessary friction on the pin. The pin may pass right through the piece A, the hole being elongated to about $\frac{3}{8}$ inch to allow the necessary movement, or the key may be supported by the piece A resting on the top of the pin. Next prepare fifteen pieces of mahogany or birch 14 inches long, 1 inch deep, and $\frac{7}{8}$ inch thick, and glue one on to each natural key, as shown at C in Fig. 95, slightly rounding them on the top and front edge. Next prepare ten pieces of similar wood, $4\frac{1}{2}$ inches long, 3 inches deep, and $\frac{3}{4}$ inch thick, and glue them on to the sharp keys, as shown at D in Fig. 96, slightly rounding them on the top and front edge. Some prefer these pieces to slope upwards a little from the front to the back. You may now insert a wire spring under each pedal, as shown in the illustration, in Fig. 97, fixing one end into the back cill, and allowing the other to run free in a groove mark on the under side of the keys.

The front board may then be prepared of 1 inch stuff, 5 inches high, and screwed on to the front cill. The front cover board, or heel rest, may be of the same thickness, and screwed on to the top of the board, as shown. The back cover board may also be of 1 inch stuff, and should have holes bored through for the tops of the pins to pass through, but the pins should not fit tightly into these holes, as the cover board may have to be removed at some future time to get at the pedal keys. The top of the cills, and also the under side of the back cover board should be lined with three or four thicknesses of carpet felt to secure perfectly silent action.

This completes the pedal-board as shown in Figs. 93 and 98. If, however, it is desired to make a radiating concave pedal keyboard, you proceed according to the plan shown in Fig. 94. The back cill will be 3 feet long, or rather more, and the front one 2 feet 6 inches long, each being divided into thirty spaces, as described for the straight keyboard. The pedal keys at the sides are slightly longer than the inside ones, in order to bring them level at the ends, and the raised slips of the natural and sharp keys are arranged so that the front ends form a concave curve, and the front and back cover boards follow the lines of these curves, as shown by the dotted lines in the plan given in Fig. 94.

Instead of making the keys to work on a pin at the back end, as previously described, they may be made to pass through a sort of rack formed by fixing a stout pin of oak in the back cill between each key, as shown by the small circles marked on the drawing. The oak pins must be covered with cloth to prevent rattling. Of course this plan is equally applicable to either kind of keyboard, but I consider the pin movement better than the rack.

I must leave it to the amateur to decide for himself whether he will have a straight or a radiating keyboard, as there is much difference of opinion among musicians as to the relative merits of the two varieties. The keys in modern radiating keyboards do not spread out so much as those made years ago.

In my next chapter the action connecting the pedal keys with the pallets will be described, and the mysteries of the rollers, etc., shown in the drawing accompanying this chapter will be explained.

(*To be continued.*)

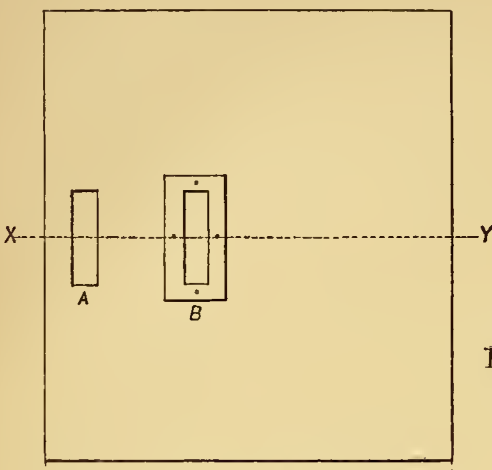
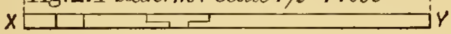


Fig. 2. *Platform. Scale 1½" - 1 foot*



Section thro' the line X. Y.

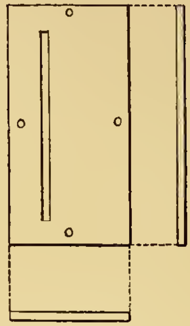


Fig. 3. *Saw, & kerf slip*
1½" - 1 foot

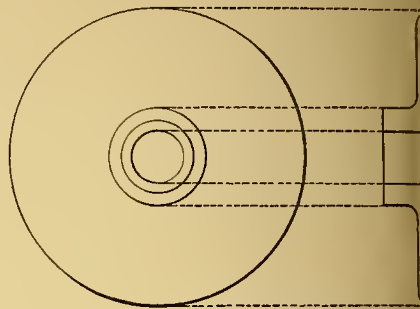


Fig. 14. *Small Pulley*
Scale 6 in - 1 foot

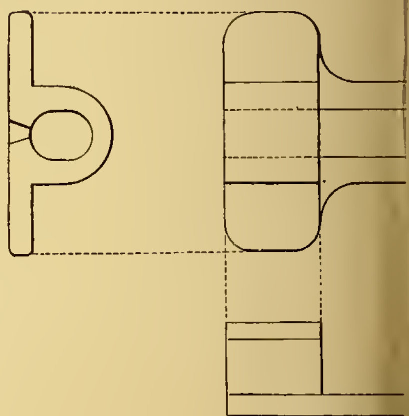


Fig. 7. I

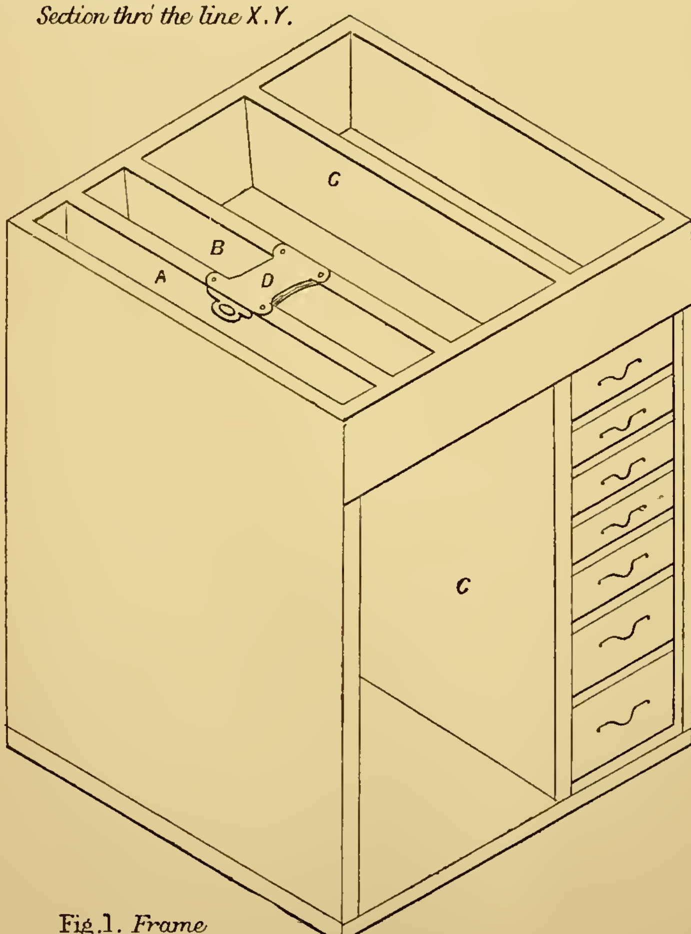


Fig. 1. *Frame*
Scale ¾ in - 1 foot.

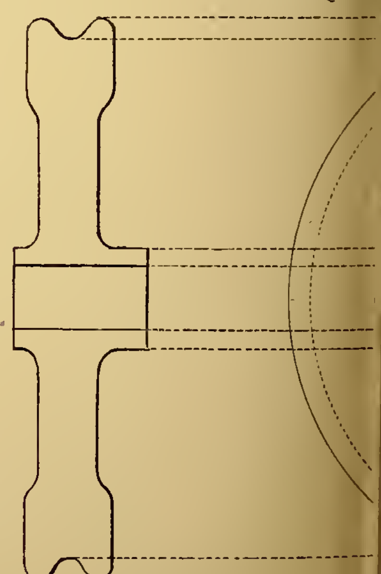
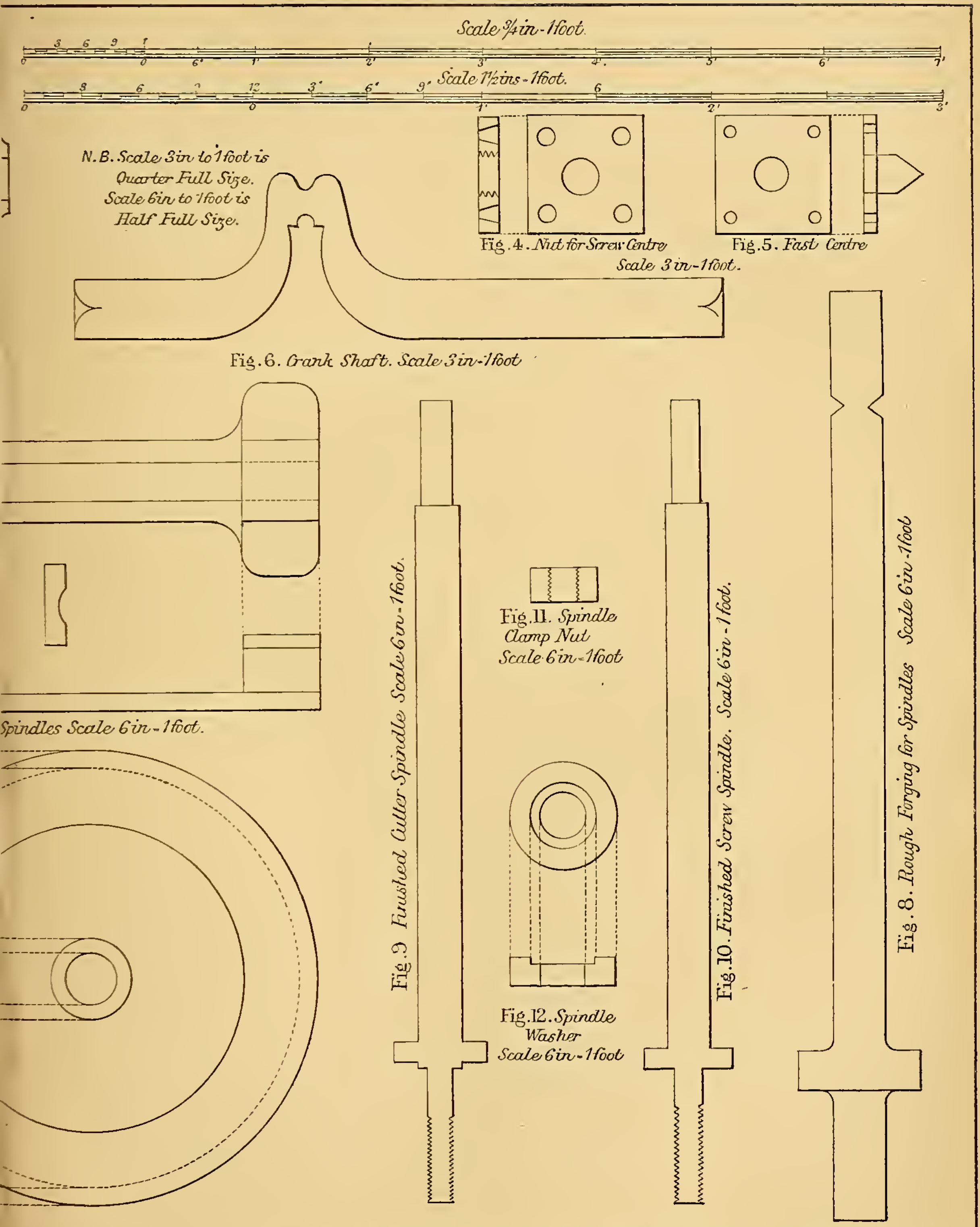
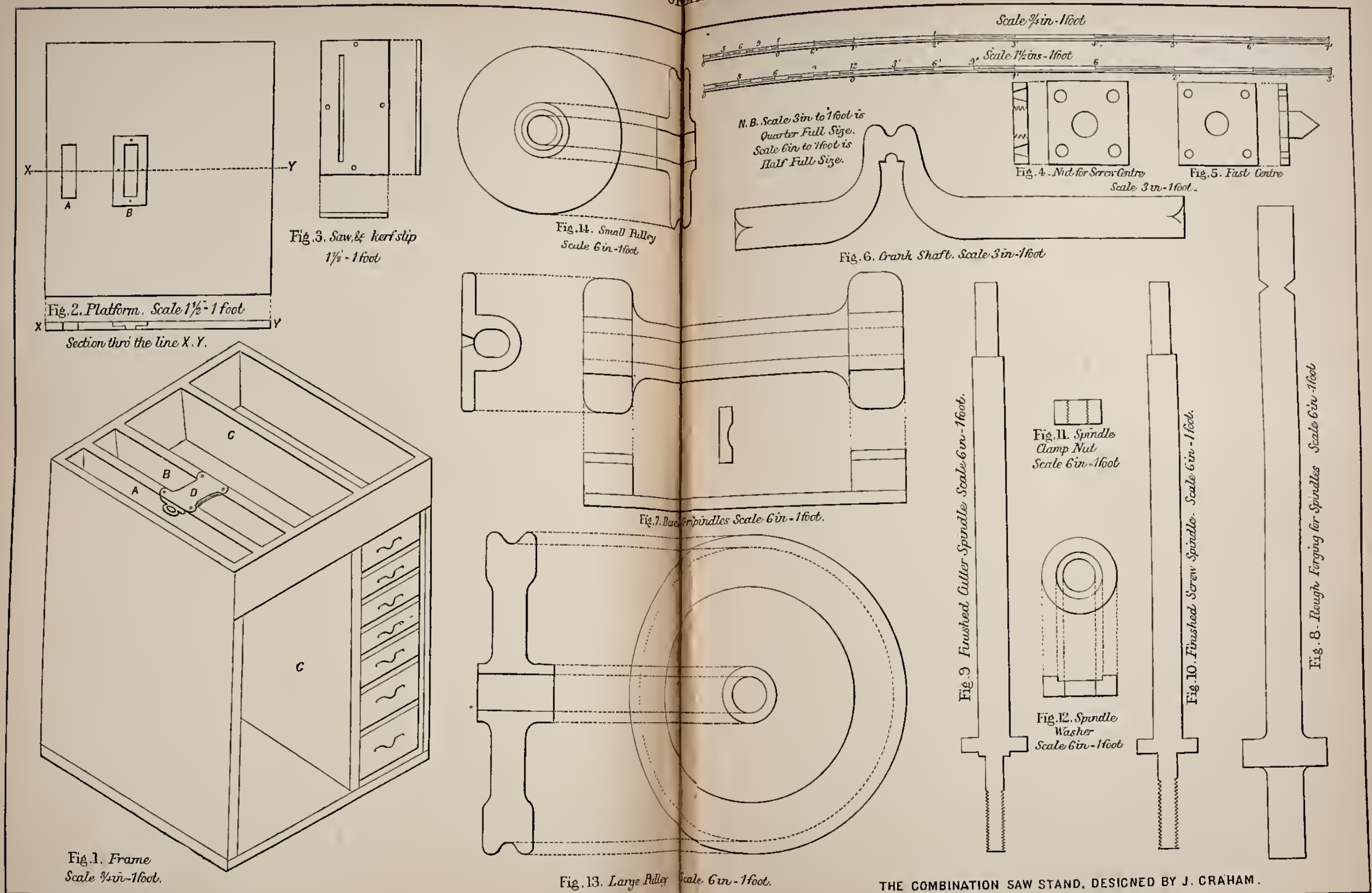


Fig. 13. *Large Pulle*

Ward, Lock & Co., Warwick House, Salisbury Square, London, E.C.



THE COMBINATION SAW STAND, DESIGNED BY J. GRAHAM.



THE COMBINATION SAW STAND. DESIGNED BY J. GRAHAM.

Ward, Lock & Co., Warwick House, Salisbury Square, London, E.C.

THE "COMBINATION" SAW STAND.

By J. GRAHAM.

(*For Figs.* 1—14, *see Supplement presented with this Part.*)

COMBINATION MACHINES—when the combinations are very different in character, or when much alteration is required in the main portions to produce the divers results intended—are for the most part, a mistake; but when, as in a lathe, which may be looked upon as a combination tool, the main portions remain the same, and sundry additions only are required to change into a machine for circular or scroll sawing, milling or drilling, grinding or polishing, and even planing or shaping, then the combination—taking up as it does much less floor space than a separate tool for each class of work would require—may be looked upon as useful and convenient. Thus it is with the machine about to be described; in one frame or stand we have a foot-power circular and scroll or fret-saw, a kind of mortise and tenoning machine, a moulding machine, a light wood planing machine, and a drill for wood or metal can easily be added if required. The whole apparatus is simple in the extreme, and entirely within the capabilities of an ordinary amateur, possessed of even but a slight knowledge of carpentry and turning. Little extra work is required, further than the driving-wheel and crank axle, and a few small forgings easily obtained from the nearest smith, while the tools used in connection with the various processes are by no means expensive.

Fig. 1 represents the stand or frame. As will be noted, it is divided into two portions by the partition C; that portion to the right hand being fitted with a set of drawers for the reception of the various tools, and the portion to the left for the driving-wheel and treadle.

The frame should be substantially made up, 1½ inch hard wood being sufficiently strong without being too cumbersome. The frame is 2 feet 10 inches square, and stands 3 feet 5 inches high, and may either be put together as shown, or framed up and panelled according to the taste of the worker. The front rail is 7 inches deep, and the two slips A and B, for the support of the saw-spindle boxes, are also 7 inches deep and 1½ inch in thickness, mortised in at both back and front of frame exactly 4 inches apart, that on the left, A, being 4½ inches from outside of frame. The partition, C, is 1 foot 9½ inches from same end, being a space of 20½ inches for the driving-wheel axle and a breadth of 9 inches for the drawers.

The lid or platform is next got out, and, the apertures having been left for the pulley and saw kerf, is to be hinged with strong butt hinges to the *front* of stand.

Fig. 2 gives the sizes of the apertures and their exact position; A being that for the pulley, and B for the saws, cutters, etc. The size of the lid being 3 feet 2 inches by 2 feet 10 inches, it should project over both back and front 2 inches. Its thickness should be at least 1 inch. To further extend the capacity of the stand, it is as well to drop bottoms into the spaces between A and B, B and C, and the top of drawer space. An elevating screw, or other means for raising the platform to any desired height, is now to be added at the back of frame.

On referring to Fig. 2, it will be seen that the aperture for the saw kerf is larger than usual, being 8 inches by 2 inches, with an extended rebate at sides of 1 inch, and ends of 1½ inch. Into this a piece of mahogany, Fig. 3, is fitted carefully, or rather several pieces—say half a dozen—as one will be required for each sized cutter, the kerf in each being the exact size of that cutter.

The treadle, Fig. 15, should next be made, and fitted to back of frame with hinges.

We may now proceed to hang the crank shaft, Fig. 6. It is intended to revolve on centre points. The centre point to the right hand, Fig. 5, is immovable. It should be slightly let into the partition C, and screwed to it with short thick screws. The left hand end of frame should be bored to take the adjustable screwed centre-point, and the nut, Fig. 4, screwed to the frame *inside*. The centre screw should also be provided with a lock-nut and washer to be used *outside* the frame. It is not of great importance in what position the crank is placed so long as it runs truly, but two points, each 15 inches from the floor and 15 inches from the front of frame, will be found the most convenient.

The driving-wheel should be heavy and of good size, and fit its crank-shaft accurately. It should have three speeds—29 inches, 27 inches, 25 inches, or thereabouts—and should have means provided to bring either speed in a position to band fairly with the pulley in the saw-spindle.

The boxes for the reception of saw and other spindles have now to be placed. An inspection of Fig. 7 gives the construction and size. The lid having been already placed in position, no difficulty will be experienced in placing the casting correctly. It may, however, be noted that the casting should be placed flat side upwards, and let in flush with the top edges of A and B.

Should anyone not be able to obtain the boxes in their own neighbourhood, they can be got from Messrs. Booth Bros., *Dublin*, fitted with saw-spindle complete, for a moderate price.

We may now turn our attention to the spindles. Of these, two will be required, and a couple of extra

ones found convenient. To those having a lathe it will be an easy matter to turn them up themselves. Fig. 8 gives a view of the rough forging. As will be noted, on reference to the drawing, it is somewhat longer than is required, the additional portion being for the dog or carrier to grip, so that the *whole* spindle can be turned up without changing it end for end, in the lathe ; therefore, any portion which is truly turned circular will be concentric with any other portion which is truly turned. The extra portion should therefore not be cut off until all the turning and fitting is finished. When the end is to be removed, a deep groove is made all round at the proper place (as shown at X in the figure), to allow of an easy breakage. Fig. 10 shows the finished saw-spindle, and Fig. 9 the finished cutter-spindle, the difference between the two being in the addition of a slight flange turned on the right hand face of the collar of the latter. The collars of every spindle must be turned up of an equal thickness, and care should be taken to make each spindle as nearly as possible of a size. The nut and loose collars are shown in Fig. 11 and 12, respectively. Though a practised metal turner will experience no difficulty in the accurate fitting of these spindles, it will be as well, perhaps, to note, for the benefit of our less skilled brethren, the proper method of procedure in this and similar work.

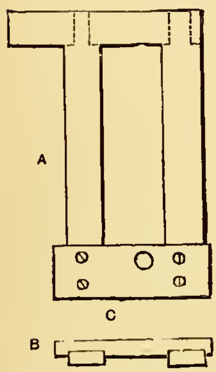


FIG. 15.—TREADLE FOR SAW FRAME.
A, Plan; B, End Elevation at C.

The spindle having been centred and the ends squared off, the spindle should be roughed out all over to nearly the finished size, collar and flange turned on it to exact size, right hand screwed end finished to size. The spindle should then be taken out of the lathe, and the loose collar proceeded with. Turn up one face, reverse it ; turn up other face, bore, and turn out the hollow to fit flange on spindle collar. Cut the screw on spindle end, fit nut, put on loose collar and finish all off together. The extra bit may now be cut off.

The pulleys, Figs. 13 and 14, now only remain These should be heavy and fitted with a set screw to the spindle end, a flat being filed on it for the ends of the screws to bite. Our frame is now finished with the exception of the drawers. These may be put in at once, or added as required. No mention has been made of a crank hook. I do not advise one ; I much prefer a short piece of plaited sash-line, once round the crank and knotted on the underside of treadle. It works more freely, requires but little oil, is always clean, and has one or two other advantages. Strong gut should be used for bands, hooks and eyes carefully fitted, and the bottom of the grooves in both driving-wheel and pulleys rounded to prevent the bands getting out of shape.

Two saws should be provided at least, but three would be found handy, viz., one each for hard and soft woods, and a rip saw, all to be not more than 7 inches in diameter, that size being the most that can be driven by foot power. A small saw not more than 3 inches in diameter will also be found useful for cutting thin wood, such as picture frame backing and fretwork.

In using the circular saw no more of the saw should be brought into cut than is required for the work on hands. The power required to drive is thus reduced to a minimum; this is accomplished by raising the table by means of the elevating screw at back of frame, till only the required portion of the saw appears above the kerf. Care should be taken not to press on the work unduly, and to keep it true to the saw, else the saw will become heated, and spring out of true. All the saws will, of course, have a hole in centre to fit the same spindle.

(*To be continued.*)

HOW TO MAKE PICTURE FRAMES.

By H. MILLBROOK.

III.—NOVELTIES IN PICTURE FRAMES.

AFTER describing fully in my last paper how Oxford frames of the ordinary type are made, I propose to give designs of different styles, showing variations from the plain Oxford frame with bevelled edges.

In Figs. 13 and 14, I have endeavoured to show how this treatment may be varied, and the effect of the frame enhanced. It will be seen on reference to the design, Fig. 13, that this treatment consists of a raised bead-moulding. The frame is made in the ordinary manner, and, after being fitted together to insure accuracy, the moulding is worked on. In Fig. 14, a different treatment is shown, the surface of the frame being panelled, and the panel being either bevelled or hollowed at the sides. I need not, I think, enter fully into details as to how the extra work is done, as my sketches of the corners and the sections of the frames give a sufficient idea for the ordinary amateur to work by. I may add, however, that chisels and gouges should be used to work the mouldings. A useful little instrument for regulating mouldings may be made by getting a piece of beech-wood, about 5 or 6 inches long, and $\frac{1}{2}$ inch thick, and shaped as

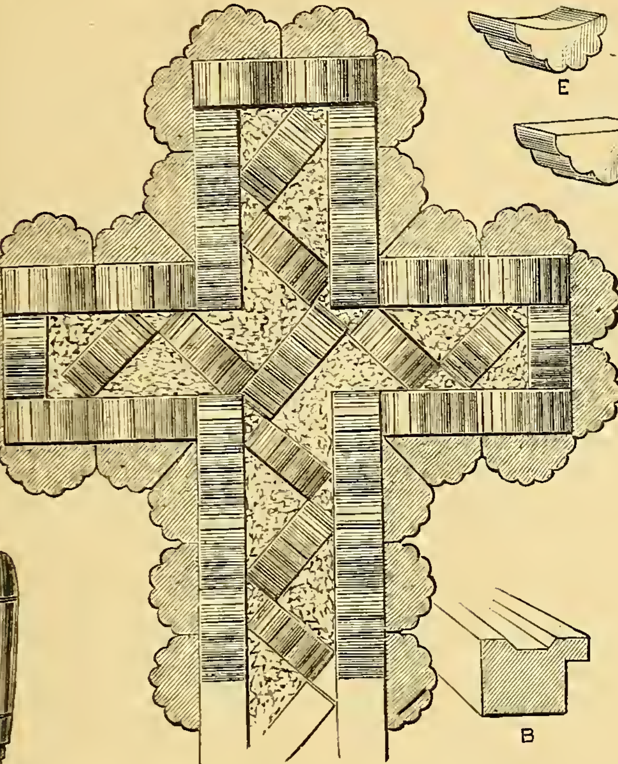


FIG. 17.—FRONT VIEW OF CORK FRAME.

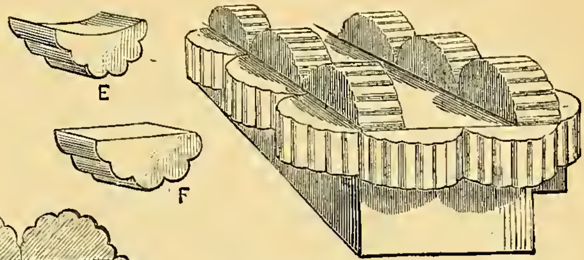


FIG. 18.—PERSPECTIVE VIEW OF CORK FRAME.
E, F, Pieces of cork ready for gluing.

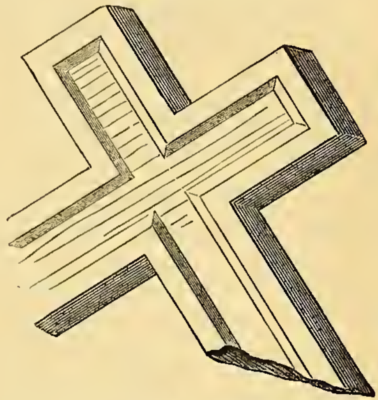


FIG. 14.—DESIGN FOR OXFORD FRAME.
B, Section of Frame.

FIG. 16.—CARVING TOOL.
D, Sweep of Tool.

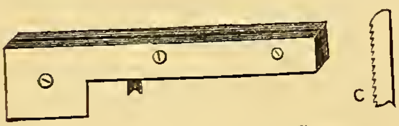


FIG. 15.—SCRATCH. C, Cutter.

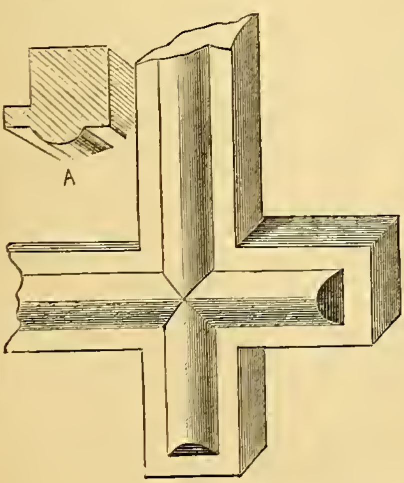


FIG. 13.—DESIGN FOR OXFORD FRAME. A, Section of Frame.

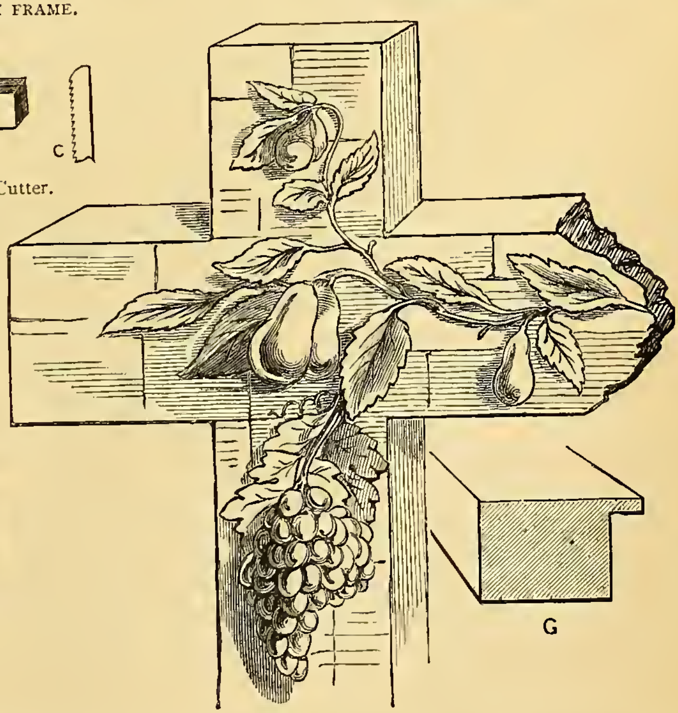


FIG. 19.—DESIGN FOR FRAME IN CORK. G, Section of Frame.

shown in Fig. 15. After shaping and smoothing the sides of this piece of wood—care being taken that the shoulder is at right angles—three or four holes should be bored to admit the screws. After this is done, saw the wood through the centre lengthwise, and then screw the two halves together.

Next make a cutter from a piece of thin steel—part of a narrow hand-saw will do—filing the edge so as to fit the moulding required, as shown in C, Fig. 15. This cutter is then inserted between the two pieces of wood, at the required distance from the shoulder and at the proper depth, and the screws are then driven home. Of course, this little contrivance should be used more as a regulator than as an actual maker of mouldings; and the wood should be eased away, and the shape of the moulding roughly cut with chisels, before using the "scratch," as this little instrument is termed. Nearly any shaped moulding can be regulated, and, if firmly held and the cutter is properly made, it answers better for small mouldings than a plane.

Should the cutter get blunt, it can easily be sharpened by rubbing both sides on an ordinary oil-stone, and then rubbing straight across the face with a slip of Arkansas stone that fits the shape. The cutter shown in my sketch is simply a hollow, and would do for regulating the bead of the Oxford frame shown in Fig. 13. Of course, this "scratch" will be available for numerous odd jobs, and can, I have no doubt, be improved upon by the ingenious amateur. But to return to our frames. In most home-made frames the Oxford is the shape chosen, and which generally forms the groundwork for those wondrous combination frames that are occasionally met with.

Many persons who have neither the appliances nor the requisite skill for making the orthodox oak frame, still wish to have some kind of frame for their pictures, and wish to save the expense of buying frames, and it is in these home-made frames that we must look for novelties.

I have, in out-of-the-way places, noticed these home-made frames of nearly every conceivable shape and style, and composed of the most unlikely materials—from pine cones to paper, and from cork to cockle-shells,—which were not only useful for the purpose intended, but were in some cases a decided ornament to the room. At seaside places, for instance, I have often met with frames composed chiefly of shells arranged in patterns, and with the interstices covered over with sand to hide the bare wood groundwork. Other home-made frames I have seen made of beech, mast, and portions of fir cones; but I think the best of these frames are made of cork.

I have also lately noticed a new style of gold frame, ornamented with a kind of incised work, which is, I believe, a "Yankee notion," but, at any rate, it looks well; and as I have lately done some frames in this style, I intend to give my readers the benefit of my experience, and describe fully how to do the work, and also give suggestions of suitable designs. First of all I will describe how cork frames are made, and what tools are required.

In the first place, an ordinary pocket-knife with blades of good material, and a carving-tool of the kind shown in Fig. 16, are all that are required in addition to the tools described as necessary for making the ordinary Oxford frames. The carving-tool can be obtained from Mr. Lunt, 297, *Hackney Road*, for 8d. or 9d.; and I suppose most amateurs are possessed of a pocket-knife. As to the material, that is easily obtained, either by purchasing the corks or by saving those that have already been used. What are termed "wine" corks are the best, and they can be bought new at prices ranging from 1s. 2d. to 1s. 9d. per gross. Care should be taken to obtain those that are close and firm in the grain. Corks that have been previously used for beer, wine, lemonade, or kindred purposes, will answer nearly as well as new ones, the only disadvantage is that they are frequently destroyed by the corkscrew in drawing them. If corks of a proper size are obtained, the carving-tool can be dispensed with, and the whole of the work done with the knife alone.

The frame, which is to serve as a groundwork, must be made first, and for this purpose we require a piece of deal, or other soft wood, ½ inch thick, the width of course depending upon the size of the frame. If the frame is to be oval, it can be cut-out with the fret-saw, and the rebate either worked out as described in my last article, or a thin piece of deal, with the inside of the oval ½ inch larger, but of the same outside size, can be cut with the fret-saw and screwed or glued on to form the rebate; and although this is a slovenly plan, it answers the purpose.

If the Oxford shape is desired, then the frame is made in the same way as I have previously described, but the same care need not be taken to make the joints fit accurately, as these will be covered with cork. The rebate can be brought to within ⅛ inch of the front of the frame, as the edge will not be bevelled in this case, and it is advisable to avoid giving a heavy appearance to the frame.

The pattern of the ornament having been decided on, the next thing to do will be to cut the corks of the proper shape and size. I have given in Fig. 17 a front view of a simple pattern suitable for this kind of frame, and in Fig. 18 I have shown (without the cross pattern) a perspective view of the same frame. The corks should now be cut into slices—cutting across, and not lengthwise—about ⅛ inch thick, taking care

that the pieces cut are all of the same thickness. The knife used for cutting must be well sharpened until a *very* keen edge is obtained; and in cutting it should be used with a drawing kind of motion, in the same way that a barber uses a razor in shaving, and then it will cut the cork cleanly; otherwise, if a straight cut is attempted, the surface of the cork would have a ragged appearance.

If the corks are of the proper circumference, the carving-tool before mentioned can be dispensed with; but if they are larger than required, a mould of the proper size should be cut out of a piece of zinc, and the corks cut to that size with the tool. It is, of course, essential that the pieces are all of the same size.

When a sufficient number of circular slices have been cut, they can be cut in half, and the edges serrated as shown in F, Fig. 18; and if the frame is oval, then the inner edge requires to be cut of a concave shape, as shown in E, Fig. 18. The surface and edges of the frame had better be roughened with a file or rasp, so that the glue may adhere more firmly. The pieces of cork require now to be glued on to the edges of the frame with strong but thin glue. Of course, the shape of these pieces and the pattern of the frame can be altered in various ways, to suit the individual tastes of the amateur; in fact, I offer these sketches as suggestions that may be improved on. After the edges of the frame are finished, and the glue has set firmly, the other pieces forming the face of the frame can be glued on, and after they are dry, then the cross pattern can be also glued on.

Our frame is now so far finished, and it only remains to hide the remainder of the wood that appears in the interstices between the pattern, and this can be done in two ways, viz., either by grinding up some cork until it is nearly as fine as sand and sprinkling it on, or by cutting small squares of cork and sprinkling it on, first of all covering the exposed surface of the wood with glue; and the outside edge of the frame can be treated in a similar manner. Our frame is now nearly finished, and merely requires a couple of coats of coachmakers' varnish to make it complete, and I think it will then, by its appearance, amply repay the maker for the time he has spent upon it.

For the more artistic of my readers I give in Fig. 19 a sketch of a frame of a more elaborate nature, and which entails a far greater amount of skill and taste, whilst it possesses the advantage of being, when finished, a really artistic ornament to any apartment. I have given a section (C, Fig. 19) and a front view of one corner of this frame only, in order to save space, but the remainder can easily be filled in by the reader, and the four corners can be made alike; but a symmetrical arrangement of the fruit and leaves will be advisable.

This frame is, in reality, carved in cork; but instead of being cut out of the solid, as it would be in wood, it is cut in small portions, and these portions are then glued on, so that the pattern is built up of many pieces. Nearly any design can be utilized in the same way, but in this case I have decided on fruit and foliage, to avoid any very delicate cutting, and affording at the same time a fair specimen of this description of home-made frame. The frame intended for the groundwork is made in the same way as the Oxford above described, the rebate in this case also being brought well to the front. The corks required for this frame must be of good quality; by quality I mean close and firm in the grain and of good colour, and the larger they are the better it will be for the amateur. However, of whatever size they may be, the first process will be to cut a number of slices $\frac{1}{16}$ inch thick and as wide as possible, to act as a kind of veneer. The frame should be roughened as before, and then the whole, excepting of course the back, should be covered with these thin slices of cork, and after the glue has set, the irregularities of surface must be regulated either with the knife or with a razor until a smooth even surface is obtained, on which the parts in relief are to be placed.

After this veneering process is finished, the stems, leaves, and fruit of the design must be cut out, and glued on piece by piece until the whole design has been built up—care being taken to make the joints fit as closely as possible. The edges of the leaves are serrated, and the stems of the foliage, etc., are left slightly rough, the veins of the leaves being cut in a V shape before being glued on. In fact, after the whole of the pieces are glued on, the only thing to be done will be to regulate any of the joints that appear at all uneven. Give the cork work two coats of varnish, and the frame is finished.

In appearance, and in the labour that must be expended in its manufacture, this style of frame is a medium between leather work and carved wood, requiring more work than the former, but less than the latter.

I advise all my readers who have a taste for this kind of work to try their 'prentice hand in these cork frames, as I feel assured that they will never regret spending some of their leisure time in making, at a small expense, an article which is not only useful, but at the same time substantial and decidedly ornamental.

I will reserve for my next paper the directions for making the incised frames in white and gold, to which I have already made some allusion.

(*To be continued.*)

NOTES ON NOVELTIES.

HOLIDAY time, always more welcome, and, indeed, more beneficial, to those who work in earnest, whether from choice or compulsion matters but little, has come round to us once more, and will, as usual, reach its culminating point in this month of August, which by general consent seems to be commonly accepted as the best season for leaving home for a few days or weeks, as the case may be, and seeking in change of locality and temporary abandonment of daily work that rest and recreation so helpful both to mind and body when the time comes for getting into harness again. Now, whether alone or in company, it is, or at all events ought to be, the chief end and aim of all who keep holiday, to endeavour to see, and therefore to know, as much as possible of the localities they may be visiting, or through which they may be travelling, and to keep a look-out on all that is passing before them, especially when at the seaside. In doing this, there is nothing more helpful than a good telescope or field-glass, which will bring objects too far distant to be distinguished by the human eye, within the range of man's vision, and enable him to see many objects that otherwise must have remained to him as though they did not exist, without the trouble of moving from the spot where he may be standing or sitting. But telescopes and field-glasses, it will be argued, if they are to be of any genuine use, are costly articles, and beyond the reach of most persons of moderate means. That this has been so, I admit; but recently Messrs. J. Theobald and Co., Opticians, 20, *Church Street, Kensington, London, W.*, have brought it within the means of all to provide themselves with a pleasant travelling companion of this kind by the production of the cheap and excellent glasses known as the "Combination Telescope" and "Acme Field-Glass," which are well and strongly made, and finished in a manner that excites surprise, when the price at which they are sold is considered, and compared with that of instruments that are more expensive but not a bit more serviceable. The Combination Telescope is made in three sizes:—No 1, 6 inches long, opening to 17 inches, price, carriage free, 12s. 6d.; No. 2, 8½ inches long, opening to 24 inches, 22s. 6d.; No. 3, 10 inches long, opening to 27 inches, 2 guineas. Each telescope has three brass drawers and black morocco body, and a separate astronomical eye-piece and sun-glass for examination of the stars and sun. As I have had an opportunity of testing both No. 1 and No. 3, I can speak with confidence of the value and excellence of these glasses, and of their great power and clearness, bringing distant objects within the range of vision with a distinctness that is really marvellous. There is only one thing to be desired, and that is a leather case and sling-strap, which, I venture to suggest to Messrs. Theobald and Co., would be highly appreciated by possessors of these telescopes if they could see their way to supply them at an additional charge. The "Acme Field-Glass," a beautifully-finished binocular instrument, in black leather case, with spring snap and strap, will be found most useful and serviceable by tourists. It is sold for the very low price of 15s. 6d.; but glasses of similar form, but of greater power, known as the "Miniature Acme," Nos. 1 and 2, can be had, the former for 29s., and the latter for 37s., carriage free. Nothing better can be bought for the same money.

Although the old saying, "Like father, like son," is not as generally true as most others of its kind, there is sufficient truth in it to warrant its acceptation and use. It does not follow—indeed, it is far from being the case—that every man's tastes, amusements, pursuits, and opinions are in strict accord with those of his father before him, yet in nine cases out of ten, there will be enough resemblance, in one point or another, to afford an argument in favour of its retention. Sons are singularly averse to follow the professions or callings of their fathers; but there are few who do not possess some habit, trait of character, or idiosyncrasy, in common with those to whom they owe their being. Talents, too, are often hereditary, and assert their presence in generation after generation, as truly and surely as gout and rheumatism, both of which appear to be handed down in regular and unbroken succession from father to son. In the case of drawing and music this hereditary transmission is specially noticeable, and if the father have a liking and taste for art, it is almost a matter of certainty that the same taste will manifest itself sooner or later—but generally sooner—in the son. I have been led into making these remarks by a box which is before me, measuring 7¼ in. by 5¼ in. by 1¼ in., and which bears on the cover the legend, "Mora's Photoleum Process." This appears to me to afford not only a suitable present for the children of amateurs, who are fond of photography and painting combined, and who may like to encourage their little ones to imitate them in their pursuits as far as possible, but also an easy method of colouring photographs in an effective and pleasing manner to those who are unpractised in, or, to speak more strongly, utterly unacquainted with, the art of painting.

The little box containing the requisite appliances for carrying out "Mora's Photoleum Process," is sold by Messrs. Partridge & Cooper, *Royal Courts Stationery Warehouse*, 1 *and* 2, *Chancery Lane*, and 191 *and* 192, *Fleet Street*, *E.C.*, its price being 2s. 6d. The process is simple and easy, and requires no study. When tinted by this process, the photograph that has been subjected to it, appears to be coloured with the utmost care and delicacy of execution, and to have been done by a hand well skilled in manipulations of this kind. But on examining the photograph that is sent in the box as a sample of the work, the secret of the good effect is soon discovered, for it is seen at once that the colouring matter is only roughly plastered on, I may almost say, in the proper position for each individual colour, on a piece of glass placed behind the photograph, *which shades the colouring*. The photograph itself is rendered semi-transparent, and applied to the back of another piece of plass, the two pieces of glass and the photograph forming together a kind of artistic sandwich. A backing of cardboard is placed behind the piece of glass to which the colours are applied, and the layers are then bound together by a strip of black paper gummed round the edges. Any articles that may be desired to appear prominently, such as flowers, lace, jewellery, etc., may be painted on the

back of the first glass in front of the photograph. Full directions are printed within the cover of each box, for the preparation of the photograph and the other processes involved in the work, and the box further contains two glasses for an experimental essay, with prepared paste, oil, spirits, and the medium necessary for the work, a piece of very fine glass-paper for thinning down the photograph, some oil colours in collapsible tubes, and a couple of brushes—in fact, every requisite for carrying out the process, and thereby thoroughly testing it.

Messrs. H. and E. J. Dale, manufacturers of High Class Photographic Cabinet Work, Operative Chemists, and Scientific Instrument Makers, 26, *Ludgate Hill, E.C.*, have sent me their new illustrated descriptive price list, as well as a special price list of Electric Signalling Apparatus, with prices and illustrations of all the various appliances required in putting up electric bells, telephones, etc., etc. Amateurs who are contemplating the manufacture of these articles at home, or who may be thinking of providing themselves with appliances for photography, should provide themselves with Messrs. H. & E. J. Dale's catalogues. Visits to their showrooms are invited by the Messrs. Dale.

Amateur bookbinders in search of fillets, pallets, edge-rolls, ornaments, and letters for bookbinding, should apply to Messrs. George Royle and Son, Bookbinders' Tool Cutters, Manufacturers of Cast Brass Type, Stamp Engravers, aud Die Sinkers, 6, *Lovell's Court, Paternoster Row, London, E.C*, who will forward price-list and patterns on application. Messrs. Royle and Son also supply colours for marbling the edges of books, with instructions. I have no doubt that amateurs desirous of having crest or initials cut as dies for bookbinding, could get them done at a short notice, or any other special design they might require.

Mr. Joseph Lewis, Engineer, Machinist, Lathe and Tool Maker, 37, *New Oxford Street* (*opposite Mudie's Library*), sends me a prospectus of his Patent Combined Drill, Fret, and Circular Saw Machine, which he says has now been before the public for six years, and is used by many amateurs, and in various light and fancy trades. The machine to fix on lathe may be had for £3, but complete with frame, treadle, and working power, and with drill, circular saw, and improved saw-shifting apparatus, for £10 10s. Amateurs should note Mr. Lewis's address, for he makes patterns, and supplies castings of every description, which many may require, and yet be unable or unwilling to make them for themselves.

Mr. R. A. Lee, Engineer, 76, *High Holborn, W.C.*, sends me a prospectus of his Patent Lathe-shaping, Planing and Slotting Machine, which can be fixed on any turning lathe, and which amateurs who are possessed of a lathe will find a most valuable adjunct to this lathe for a variety of purposes. As the name implies, this invention enables work to be shaped and finished in an ordinary lathe, which otherwise could formerly be done only in costly machines, specially adapted for the purpose. For slotting, grooving, and truing-up, it is simply invaluable, inasmuch as it does all the work of the ordinary shaping machine, at one-fourth the cost of the latter. No extra room is required for it, as it screws on the bed of the lathe, and when not in use can be placed anywhere. It can be adjusted on the lathe in two or three minutes, and is then ready to start work at once. To those who have a slide-rest, the cost is a mere trifle; but when amateurs are not possessed of this appliance, they will find that part of the machine itself can be used as a compound slide-rest for turning in the ordinary way, the arm being so arranged that any desired length of stroke can be given, from $\frac{1}{10}$th inch to the full travel. The amount of power required to drive the machine, and such parts of the lathe as are required, when at work, is less than one-half of that used when turning. Several sizes of this machine are made to suit lathes, varying from 3 in. to 7 in. in height of centre, at prices ranging from £9 to £21, according to size, with compound slide-rest, or without the slide-rest, from £6 to £13. Amateurs, however, who require a machine of this sort, will be able to determine the size and price that will suit them, by referring to one of Mr. Lee's prospectuses, which will be forwarded on application.

Mr. A. S. Lunt, Saw, Plane, Tool, and Cutlery Manufacturer, 297, *Hackney Road*, has sent me, for inspection, a specimen of his tool chests for household use. The boxes are well made, being of polished pine, dovetailed together, and, as far as I can tell without actually using them and subjecting them to various tests, the tools appear to be of good quality, and well worth the money asked for them. It should be said that the tools are warranted by the maker. The chests are in three sizes, namely, No. 1, 19 in. by $10\frac{1}{2}$ in. by $6\frac{3}{4}$ in.; No 2, 22 in. by 12 in. by 9 in.; No. 3, 26 in. by 15 in. by 12 in. The prices of the chests respectively, *without tools*, are 5s. 6d., 8s., and 10s. 6d.; with tools, 20s., 30s., and 40s. The chests have a tray inside for small tools, etc., and are fitted with handles and a good lock and key. The tools in chest No. 1, are a 14 in. cast steel hand saw, an 8 in. cast steel iron back tenon saw, a smoothing plane, with double iron, a $\frac{1}{2}$ in. chisel, and a $\frac{3}{4}$ in. chisel, handled, an oilstone in case, a 4 in. wooden mallet, a hammer, a pair of pincers, a 2-foot rule (four-fold), a screw-driver, with 4 in. blade, two gimlets, two bradawls, and two steel punches. The tools in the larger chests are themselves larger and more numerous than those in No. 1, and purchasers may make their own selections up to the prices charged.

I have to acknowledge the receipt of some press notices relative to apparatus contrived by Mr. Thomas Fletcher, of *Warrington*, for cooking in an ordinary range without fire, that is to say, by means of gas, and two sheets of engravings of gas-heating and labour-saving apparatus for domestic purposes, and for the laboratory. These are well worthy of the attention of any person who may wish to save his coal, and the heat and dirt arising from its use during the summer months, and will doubtless be sent to anyone who may be interested in cooking by gas.

Mr. A. Fischer, 11 and 13, *St. Bride Street, Ludgate Circus, E.C.*, has issued Part I., and by this time three or four additional fortnightly parts, price 1s. 6d., of a "Pattern Book for Jewellers and Gold and Silversmiths," to be completed in twenty-five parts. Part I. contains twelve beautifully finished plates of antique gold and silver vessels, and designs for modern plate and jewellery.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Octopus Glue.

CLERICUS writes:—My experience of the use of Octopus Glue is almost identical with that of C. M. (*Fulham*). I also tried it on some picture frames, because I thought it would be so much more convenient in the use, and was not a little mortified to find it worse than useless, as it leaves a mark wherever it touches, and does not hold in the slightest degree. Nor will it keep, for the small bottle which I got a few weeks ago is becoming quite turbid, and emits an offensive mouldy smell. The Gloy, which is simply Dextrine, is useful as a substitute for gum or paste. I am glad to have an opportunity of expressing my high appreciation of AMATEUR WORK, which I have taken from the commencement. It is an excellent publication—just the thing that was needed by amateurs, and seems to increase in value every month. The pages devoted to "Notes on Novelties," and "Amateurs in Council," must be a great boon to many inquirers. [Your request for instructions in making a skylight shall receive prompt attention. I very seldom put in type any of the good opinions my correspondents are pleased to express with regard to this Magazine, but as a contributor, in sending me an article has taken exception to "Notes on Novelties," as being a medium for advertising the goods of certain firms, I take this early opportunity of referring all who may hold this opinion, to my first paper under this heading in Part I., and to say that all articles likely to be useful to amateurs when sent to me, or otherwise brought under my attention for notice, are, I trust, impartially reviewed, just as books sent for notice are reviewed in the daily and weekly press, that I am ready to notice the specialties of any and every firm that may wish me to do so, and that if some firms are more alive to the advantage to be derived from notices such as appear in my "Notes on Novelties," this surely can afford valid reason for others who do not appear to be so, to find fault with them and imply favouritism on my part towards those who are noticed. It is quite as reasonable and right to notice a new tool, or a new specialty, produced by any manufacturer, as a new book brought out by any publisher; and I can assure my readers, individually and collectively, that I intend to go on in this way, as I have now done for nearly two years, because I believe, honestly and sincerely, that it is to their interest and benefit that I should do so, for many thus have articles of obvious utility brought under their notice, which otherwise they might never have heard of.—ED.]

Simple Home Made Furniture.

J. H. (*Clifton*).—Arrangements have been made with a practical wood-worker, who is also a competent writer, for a series of articles on "Home Made Furniture." These will form a special feature of Volume III., and will be commenced in the first or second part of that volume. Your letter and sketches shall be forwarded to the gentleman who will contribute these articles, so that your special want may receive attention.

Book on Electric Matters.

C. J. L. (*King's College*).—I am not acquainted with "any book of moderate price dealing practically with various electric machines, such as the construction of dynamo and storage batteries (with details and drawings), with the different kinds of batteries and the uses to which they are individually best adapted, of fitting up the incandescent lamp for domestic use, together with hints on the methods of safely handling the wires and machines, and also with the prices of all requisite materials, such as wires, chemicals, etc." All these matters, however, will be fully handled from the amateur's point of view in this Magazine, in which papers by Mr. George Edwinson have already appeared on "Electric Bells," "Electro Plating at Home," and "The Domestic Electric Light."

Shocks from Coils and Leyden Jars.

MAGNETO.—Mr. Edwinson says:—"Shocks should not be indiscriminately administered from induction coils and Leyden jars, and other apparatus charged with electricity at a high potential. The shocks are painful to persons of sensitive temperaments, and may prove highly injurious if not fatal to those suffering from heart disease, or subject to fits. Practical jokes of such a questionably safe character should be discouraged. If you wish to test the effect on yourself, merely span the space between the poles with the little finger and the thumb of one hand, and thus allow the charge to pass through the hand alone." Mr. Edwinson, as it has been already stated, will describe a plate induction machine when space can be spared for the article.

Handy Book-Case.

A. W. K. (*Bhagalpur*) is thanked for his letter with diagrams and measurements of book-case, but if he will refer to AMATEUR WORK, for January, 1883, (Part XIV.), he will find that his contribution has already appeared, and that its originality has been disputed in subsequent parts in "Amateurs in Council." This fact by no means detracts from the merits of A. W. K.'s design, for the occurrence of the same idea to two different persons is by no means singular.

Paint on Hall Lamp.

W. P.—To remove the paint from the rim of your brass lamp, use Rendle's "Electric Paint Remover," prepared and sold by Messrs. W. E. Rendle and Co., 8, *Westminster Chambers, Victoria Street, S.W.* This preparation was noticed in "Notes on Novelties," page 94, Vol. I., where you will find a description of its action, and the results obtained by its use, both on wood and metal. It is sold in 5 lb. tins at 2s. 6d. each; but probably you might be able to obtain a smaller quantity. Your paper is under consideration, but you have merely attached your name to it without any address. All papers should have both the name and address of the writer written on the first or last folio.

Wires for Binding Pamphlets.

B. B. writes:—Messrs. Churchill & Co. have brought out a paper-fastener for printers and bookbinders, which answers remarkably well, and is almost as effective as the costly machine mentioned "as quite beyond the reach of amateurs." Price of tool, with package of assorted staples, 1s. 2d. and 2s. 4d. It is stated that a boy can bind 2,000 to 3,000 pamphlets a day with this little tool.

Filling up Joints, etc.

C. S. M. (1.) When you have failed to make a neat joint, and one in which the parts fit closely together, the better way is to take a fresh piece of wood (or pieces, if necessary), and make another. It is difficult to advise you without knowing the precise nature of your failure; but if you have a wide gap to fill, do it by letting in a piece of wood neatly, and securing it with glue. (2.) Griffin's saws are numbered from the finest, No. 1, to the coarsest, No. 10. (3.) The planing machine mentioned in the April part, is not that to which allusion was made in the January part. This is another case of a man making an offer which is accepted, and then breaking his promise, to contribute; and what tends to aggravate his breach of good faith is, that he permits four or five letters to be written to him, *which must have reached their destination, as none of them have been returned*, and deliberately leaves them without reply.

Vulcanite and Dentistry.

R. B. writes:—I observe remarks on dissolving "Vulcanite." Let EXPERIMENTALIST be most careful when adding his oil, or other medium, as directed by E. W. (*East Grinstead*). A friend of mine, with two assistants, died in a fire that arose from attempting to re-utilize this, I believe, hitherto waste material, tons of which are in the hands of railway companies. Under Amateur Dentistry, in reply to it, I may say vulcanite is simply India-rubber hardened under pressure and heat, in combination with sulphur and colouring matter; but if I state that the heat must not be less than 315 degrees Fahrenheit, and the pressure not less than 75 pounds to square inch, and continued for about ninety minutes, an amateur will see the difficulty of arranging apparatus for the work.

The "Azalea" Mantel Board.

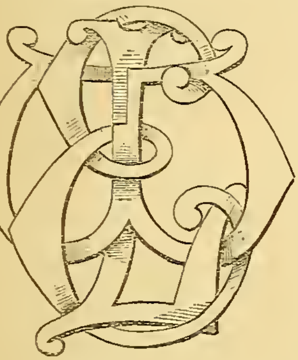
W. A. FOX.—The designer of this elegant piece of fret-cutting writes, in reference to some remarks that have been made on the lightness and apparent fragility of the pattern:—Anyone objecting to the lightness of parts at the point whence the flowers spring, could easily strengthen it by leaving a stop, like that left in the centre of the flowers. But I find it does equally as well to strengthen those points afterwards with a little glue at the back, fastening it to the velvet or darkwood background. When cutting it in quadruplicate out of four pieces ⅛-inch wood screwed together, I can make the lines much finer than they appear in the design. This ought not to be hard, for it is by no means as fine work as one would have to do if he was cutting for inlaying. And this reminds me—if the design is con-

sidered fragile in the working, it can be worked by those thinking so in the shape of overlaid fretwork, *i.e.*, fastening the cut-out work on to the dark-wood background in a way similar to veneering. This would get rid of all fear of breakage—in fact, would enable one even after the breakage, to put the broken pieces together.

INFORMATION SUPPLIED.

Queen Anne Furniture.

A. M. (*Glasgow*) writes in reply to L. W. E.:—I enclose a sketch of monogram. As it would be very confused in simple fret-



MONOGRAM, L. W. E.

work, I have shaded it in such a way to relieve it more, which should be done in execution by hollowing the shaded parts.

Tool for Cutting Mouldings.

AMIGO sends the following reply to E. W. (*Headley*):—The best tool for forming a moulding around the edge of a table top is a "high pitched" moulding plane. Two of these will be required, right and left handed, so that the grain of the wood may be contended with. The term "high pitched" is applied to a plane whose iron makes with the face a greater iron than is commonly used. A friend of mine possesses a plane of this description, and I have seen smooth work produced by it on the hardest, curliest, crossgrainedest mahogany that any unfortunate could meet. The angle formed by the iron of this plane with the wood operated upon is, as near as I can measure, about 64 degrees. The cutting edge is also rather "thick." I have seen "scratch" tools for beading but not for moulding. These are, as E. W. observes, made by their users.

Wind Power for Lathe.

AMIGO sends the following reply to W. S. (*Longside.*);—With respect to this query more information is required. W. S. should have stated, as near as he could, the circumstances under which it would be applied; for instance, the site of his workshop or dwelling, the height of same, whether there are other houses adjoining or in the vicinity likely to affect the action of a windmill or motor, the size of his lathe, and last, but not least, the material at his disposal, and limit of expense. I could give several different methods of applying wind power, but the chances are that they would not suit. If W.S. will give these few particulars, I will endeavour to assist as far as I can.

Lathes.

J. T. F. (*Brixton*) replies to C. G. (*Hobart Town*).—If you are thinking of buying lathe, more particularly for light metal work, I would say give a trifle more, nd have a reliable article to begin with. In turning with a small lathe, it is surprising how soon you feel the want of a larger article, that it is really time and money saved in the end, especially in your case, having to ship out. It would also be beneficial—though not absolutely essential—to have a back-geared lathe, and also with a gap bed. This gives you various speeds for light and heavy work, and gap bed allows work of large diameter to be operated upon. The extra cost for these two improvements s trifling compared with results obtained. I can thoroughly recommend one I have now had in use over twelve months, it is a 3 inch centre, 30 inch bed, turning work 1½ feet long by 6 inch diameter, made by the Britannia Company, *Colchester*, *England*, price £4 5s., on walnut top stand, three-speed fly-wheel complete; but I had mine mounted on their No. 13 stand, which is considerably heavier, and very steady in action, and has a much more powerful flywheel of four speeds. This arrangement will cost you 15s. more, but I can say it is well laid out, considering the additional power I get enables me to drive a circular saw, 6 inches in diameter, and do all kinds of picture frame work, mitring, rabbeting, slotting and grooving, and so on. The same firm also supply a great variety of useful attachments, several of which I have, and find them all what they claim them to be, notably their long arm fretcutting attachment on the vertical principle, taking in work of good size, and cutting inch and half thick easy as veneers. I have also the Essex chuck with twist drills, and find it excellent for light metal work; you would find it very serviceable and accurate. I can also recommend for light work in general, both metal and wood, the No. 1 lathe and fret saw, a combination of several tools in one machine. I had one in constant use for two years, and only parted with it for the larger concern I now have, and which I would feel pleasure in showing you were you nearer home, and give you any further assistance possible. They have just brought out a new lathe at 55s., 2½ inch centre, but can be blocked up to suit larger work. I should add this blocking up is a peculiar feature and advantage in the lathes made by this Company. For further particulars see their illustrated prospectus, post free on application.

Hammocks.

HALF JACK sends the following reply to H. J. (*Finsbury*):—Having made several strong serviceable hammocks for myself and friend, I give here my mode of procedure. In the first place, I presume H. J. knows how to net, if not he must get some one to teach him, as it is almost impossible to do so on paper, but if there is no one he knows who can net, I will endeavour to show him on paper, if he will send me his address; of course, I am now supposing that he knows nothing about it. Procure a wooden mesh, say 1½ inches wide, with needle to match, which may be bought at any twine shop for a few pence, and where suitable string will be obtained if the purpose to which it is to be applied is mentioned. Now make a large loop on the end of the string which is wound on the needle, on to this net 24 loops which will make the width of the hammock 3 feet, now net backwards and forwards until 64 loops or rows are completed which will make the length 6 feet, then thread down each side a piece of cord, the thickness of a lead pencil, and not less than 8 feet long, fastening the ends round a "dead eye" or ring hollow on the outside, now gather up all the loose loops at the ends, pass through them a piece of string and fasten up to the ring, this is to keep the loops out of the way. When it is desired to hang the hammock, pieces of cord must be passed through the ring and slung on a hook or round a tree, a piece of stick, 18 to 24 inches long notched at each end and placed between the cords at top and bottom, will keep the netting stretched open.

Fretwork Epergne.

C. J. M. (*London*) advises A. K. (*Soham*) by no means to use gold paint to his épergne. It is not gold, and it does not look like gold, and turns black in no time. If he gives the article two coats of strong parchment size, he can put anything on it, both leaf and gold paint. Unless he doesn't wish the grain of the wood to show, he must lay on several coats of size and whiting, made about the consistency of cream. He bad much better use leaf gold.

Liquid Damp-proof Glue.

C. J. M. (*London*) earnestly advises J. B. (*Jubbulpore*) not to use Octopus Glue. It is practically useless. [This, of course, is merely C. J. M.'s opinion.—ED.]

Re-Gilding Picture Frames.

C. J. M. (*London*) in reply to T. S. (*Brinscombe*) begs to inform him that it is not necessary to remove the old gilding. Let him thoroughly clean it (weak acid and water will do), then lay on several coats of parchment size and whiting about the consistency of cream. Rub that down with fine, No. 0 emery, till it presents a polished surface. On that lay a thin coat of oil gold size, and when just "tacky," gild. Finish with parchment size made rather thin. Success requires some practice.

Difficulties of Amateurs in the Colonies.

GRAHAM sends the following for the information of C. G. (*Hobart Town, Tasmania*) and others who may require it. Ink for writing on glass may be obtained from J. Sabatin, 9, *Bread Street Hill, London*, at 1s. 6d. per bottle (gutta percha), postage to Tasmania 2s. for under two ounces, about its weight. Griffin's Fret-saws can be obtained from Messrs. Churchill, who would, I am sure, if you sent them a list of your requirements, obtain for you those things they could not supply, and pack all off to you at a cheap rate. I feel sure that there must be many intending emigrants among the readers of AMATEUR WORK who would gladly bring out a supply of such articles as are needed by the amateur, and retail them at a sum sufficient to cover the expense thereof.

Design for Overmantel.

E. Johnston, who has sent a design for an overmantel in answer to Chips, is requested to forward a detailed description of the material used, method of making, etc., to accompany the design.

Ink for Rubber Stamps.

F. N. E. (*Southport*).—Perhaps the following receipt from the "British Journal of Photography," March 10, 1882, may be useful to J. B. (*Jubbulpore*): Aniline red (violet), 90 grains; boiling distilled water, 1 ounce; glycerine, half a teaspoonful; treacle, half as much as glycerine. The crystals of the violet dye to be powdered and rubbed up with the boiling water, and the other ingredients to be stirred in. The solid aniline dyes could no doubt be obtained from Messrs. D. Judson and Son.

Fixing Gilt Cornice on Valance Board.

T. H. (*Settle*) writes in reply to J. T. F. (*Brixton*), who asks how to fix a cornice on to valance board. The cornice should be made entirely separate from the valance board to the size required. The valance board is then made, with sufficient space being allowed at ends for the fixing of fringe. The fringe is hung on a small hook, which is driven in on one side and both ends of valance board, and by this means can easily be fixed or removed. The valance board is screwed fast in its position on brackets, and the cornice is made to slide on small hooks, which may be obtained of any ironmonger.

Hard Stopping for Wood.

Amigo sends the following reply to Exon:—The most durable stopping that I know of for cracks in panels, etc., is made by mixing a little whiting with white lead. Some use shellac, but this won't always match the colour; it has the merit, however, of holding on.

C. J. M. (*London*), in reply to Exon, advises him to use white lead and whiting worked to putty-like consistency in the fingers.

Pipes from Potatoes.

Chemicals sends the following reply to Light-keeper:—The particulars given in the extract are not very explicit, but the substance referred to is no doubt a crude "cellulose." The quantity of acid required would, of course, depend on the quantity of potato, but I should think very little would do, for if potatoes are boiled in strong acid sugar would be formed. I doubt whether the authorities would allow of its being sent by post, for it is dangerous. Trade price here for small quantities, 1d. per lb.; chemist's price, 3d. I shall be happy to get you some, if you find a difficulty in doing so. Unless your meat-can is well tinned, it would be better to use a porcelain or glass vessel, and I do not think there would be any need to add more acid, only water. I hope, however, in a week or so to have some spare time, when I will try it myself and let you know the result. [Will Chemicals send his name and address with any future communications. He offers to get a certain article for Light-keeper, but it is not possible to forward any application to him without having his address. —Ed.]

Silvered Glass for Mirrors, etc.

J. M. H. (*Alnwick*) who has inquired where he may obtain bevelled silvered glass for the "Lily Mirror," is informed that he may procure all kinds and sizes of this material of Messrs. Harger Brothers, *Settle, Yorkshire*. Other readers in want of glass for brackets, etc., should make a note of this.

French Polishing.

Amigo sends the following reply to Antipodean:—I take it that our friend wishes to polish the inside part of the work or that formed by the saw. This is not customary, and in small work impracticable. The best plan is to use varnish, applied with a camel-hair brush. One coat of this will suffice for inside work unless very open, and two coats for outside. This should be done before polishing. Any existing inequalities from the saw should be removed with a knife or file. Be assured that the varnish is perfectly dry before removing the blots which gather on the face of the work, otherwise in rubbing down the dust will cling and disfigure the varnished parts.

Amigo sends the following reply to J. H. (*Dudley*):—"Spiriting off," or "fixing," as some call it, is a final process in polishing, and is similar in action, except that instead of polish, a few drops of spirits of wine on the same rubber and a very light, swift hand used. The spirits removes the oil which has been used in polishing, and prevents the acquired polish from becoming spot dimmed and dull.

T. H. (*Settle*) wishes to inform Antipodean that he will find that to attempt to French polish fret-work will be both difficult and tedious, and in some cases no improvement to the appearance of the article operated upon. Different kinds of wood require different treatment. Walnut, in fret-work, looks well with two or three coatings of boiled linseed oil at intervals, and without any polish, and has not the daubed appearance which many amateurs give their work. Oak, and some other light woods, require one coating of oil, and it is best to apply this with a camel's-hair brush, as being most likely to enter the most intricate parts), rub down with a few rubbers of white polish, and finish with fine white varnish. In most cases a good appearance will be obtained with half the trouble it would require for polishing. To those who will not submit to have their work finished with anything but the polish, there is nothing but great patience and painstaking will accomplish it.

T. H. (*Settle*) writes in reply to J. H. (*Dudley*):—The "Spiriting off" is given when the French polish has been applied in sufficient body, and the oily appearance of the work has to be removed. With a clear rubber, methylated spirits is applied, care being required that this is given up at the right moment, when the clear mirror-like appearance is obtained.

C. J. M. (*London*), replying to J. H. (*Dudley*), informs him that "spiriting off" is the last act in the process when spirit only is used to "kill" the oil that has been previously put on the rubber to make it work smoothly.

Eidograph.

E. W. (*Richmond*) writes:—I. M. (*Kirkcaldy*) p. 339, seems to be inquiring as to the nature of the Eidograph. It is an improved form of the Pantograph, and is used for the same purposes. An illustration of it is given by Elliott Brothers, 449, *Strand*, in their list of Mathematical instruments; the price is £10 10s.; my list is dated 1874. It is also illustrated and described in "Knight's Practical Dictionary of Mechanics," p. 775.

INFORMATION SOUGHT.

Bending Bamboos.

Beauchamp asks:—What is the best plan to adopt to bend bamboos? so that arms of chairs, etc., can be made.

Polishing Horns.

E. B. (*Penge*) writes:—I have a pair of Koodoo horns, which I brought from S. Africa some years ago. Can you answer me, through Amateur Work, how I am to set about polishing them?

Black Stain for Bamboo.

Beauchamp asks: — What is the best stain for staining bamboos *black*. I want to produce a dull jet black upon the yellow bamboo, but I think it will be a difficult matter, as the outside of the bamboo is so smooth. Would sulphuric acid be of use?

Hot Water Supply for Baths.

H. L. (*Petersfield*) writes: — I shall be obliged if you will inform me what is the cheapest and best method for constructing a hot bath that will provide about 30 gallons of hot water in some reasonable time. I have a room and range which I could set apart for the purpose.

BRIEF ANSWERS TO MINOR QUERIES.

Politzer. Your interesting communication shall appear in "Ways and Means."—A Poor Man. I will endeavour to procure the information you require, and thus help you, but I cannot undertake to make purchases of lenses, etc., for you.—Cantium. An excellent example of a rustic porch is given in the present part. Address any inquiry you wish to make to the Editor, and he will see that your requirements are satisfied, if it be possible to do so.—L.W.E. Instructions will be given for making printing presses. If my memory serves me rightly this query has been answered already. The other shall be answered next month.

*** Communications from the following are acknowledged and will receive attention next month. All queries are answered or attended to immediately when it is possible to do so, but when replies are deferred, it must be understood that it is owing to want of space, to difficulty in obtaining the information asked for, to the inquiry having came to hand too late, or to some other cause that is beyond the Editor's control. —Chocera; Amigo; E. W. (*Richmond*); L. M. T. D. (*Glasgow*); V. (*Ambleside*); C. J. M. (*London*).

Erratum.—In "Rapid Heating of Bath," col. 1, page 451, *for* "Messrs. Phinsaul Bros." (Ironmongers, *Plymouth*,) *read* Messrs. Plimsaul Bros.

THE VIOLIN: HOW TO MAKE IT.

By EDWARD HERON-ALLEN.

VI.—THE BELLY (*continued*).

THE next step is to put in the pegs; these are the small round spots of wood let into old fiddles at the top and bottom of the back, for the reasons already set forth, namely, to secure the back and belly at these points when fitting them to the sides, before the iron cramps were used for this purpose.

You will notice that every Stradiuarius violin has them just so placed in the back, *on* the join, that they are cut in two halves (of which only one is left) by the purfling, as at A, in Fig. 44. Although these are not absolutely necessary to the fiddle, yet, as you are working on the Strad. model, they impart a finish to your fiddle as a copy. Take a round, sharp-pointed tool (such as the marking - point), and press a hole just where the centre join of the fiddle meets the groove cut for the purfling (as in Fig. 44), so that half the hole is in the groove. Make a similar hole at the bottom to correspond, and also similar ones in the belly at top and bottom, and then cut your four pegs to fit. These are made out of a rod of maple, not highly figured, but of a colour which contrasts with the maple of the back. Cut the rod to a long, round point, like a pencil, cut off the extreme end, and finish with a file, so that it exactly sticks into the hole you have made; cut off the point about $\frac{1}{8}$ inch long, and tap it into the hole, so as to stick whilst you fit the rest. When all are cut, dip each one into glue, and fix it into its hole with a good smart tap, and leave them to dry thoroughly. When this is accomplished, cut off the projecting ends, so as to make them flush with the back, and cut off as much from the sides of the pegs as projects into the groove cut for the purfling, which will reduce it, as in Fig. 44. Now take a brush full of water and wet all round the grooves on back and belly, wiping off superfluous moisture with a cloth. This will throw any defects in the uniformity of the grooves into prominence, and this will enable you the better to correct any such irregularities. When this has been done, you will be ready to put in your purfling. Purfling, as I have said before (Vol. I., page 256), is composed of a strip of plain wood between two strips of the same wood stained black (not, as some have supposed, a strip of rosewood between two of ebony). The exceedingly delicate diameter of these strips may be imagined, when we reflect that the three glued together and inlaid only present a diameter of $\frac{1}{16}$ inch. Purfling may be bought of any fiddle-maker; and I should advise the amateur to purchase his purfling ready cut, though I shall tell him how to prepare it for himself. It is sold in two forms; in separate strips of black and white plain, and also as a sandwich, ready glued together; the latter is perhaps the easier to work with, but is terribly liable to split, and in putting it in it will be necessary to dip the ends in the hot water of the glue-pot for an instant (not long enough to unglue it) before giving the ends the strong bend necessary at the corners and centre bouts. An experienced fiddle-maker will always prefer to inlay three separated strips together rather than chance a split with the ready-made purfling. If you use the disintegrated purfling of the thorough Luthier, it is prepared as follows: Get some long strips of plane veneer in the natural state, and also stained black, as thin as you can; cut it, for convenience' sake, into leaves 4 inches by 2 feet, and reduce it by means of scraping as nearly as possible to a uniform thickness of $\frac{1}{48}$ inch *at the most*. Now make one edge *absolutely* straight and true (by means of a steel rule and knife), and then cut it up, by the same means, into strips $\frac{1}{12}$ inch broad. When you have got double as much black as white, you can proceed to fit it to the grooves, commencing, as usual, with the C's, or inner bouts. Take three strips (two black and one

FIG. 45.—MODE OF WORKING PURFLING.

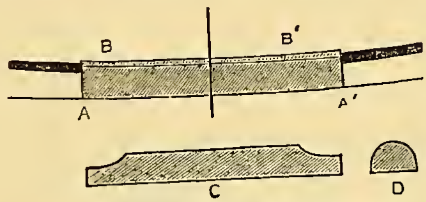


FIG. 46.—FORMATION OF CHAMBER TO RECEIVE REST.

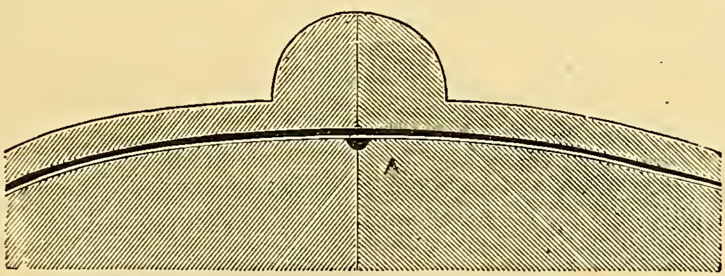


FIG. 44.—POSITION OF PEG IN BACK OF STRADIVARI VIOLIN.

white), or a piece of sandwich which you judge to be long enough to fit the bout you are working on; make the ends (at one end) even, and with a sharp knife bevel off the three together, as in Fig. 45. Fit this point close up into the corner shown in Fig. 43, and carrying the strips round to the other corner, fit them into the other corner with another bevel, which you must be rather careful about not to make too short, fitting it, in point of fact, much the same as you fitted your ribs into the mould, as described already. Next proceed to fit in another three from the corner to either the centre join, or right round the upper (or lower) bouts to the opposite corner. If you cut them to the centre join, you must make the point of union very close, square, and, if possible, imperceptible, especially in the back. In the belly, you need not care about making so exquisite a job, for the purfling will be cut away at the top to receive the neck, and will be hidden by the finger-board, and at the bottom to receive the rest, and will be hidden by the tail-piece. For the same reasons, it is often omitted to put the pegs (Fig. 44) into the belly. When you have got the purfling fitted all round, you can proceed to glue it. For this purpose the purflings must be taken out, a sandwich, or a set at a time, the grooves filled with glue, and the sandwich or three strips replaced, being most careful to make them fit accurately at the corners, and particularly at the joints at the top and bottom of the back, where the three strips must join those opposite so exactly, as to render the join imperceptible. This is best effected by cutting off the ends at the join, just slanting downwards from the top edge, just as the linings of the inner bouts were fitted into the corner blocks, as shown in Fig. 28. Mind and use plenty of glue before setting the strips into the grooves; for, remember, it has not only to fix the purflings into the groove, but also, if you use three strips, to permeate between the component strips themselves, to keep them together. It also fills up and disguises any errors or faults in the cutting of the groove, which it is impossible (especially for an amateur) to obviate; therefore, when the purflings are set in the groove, it is well to run a little glue all round them with a little slip of wood to fill up anywhere where there was not sufficient.

The purflings are tapped into the groove all round with a little hammer to insure their sinking well into it. The superfluous glue is then wiped off with a cloth, and the whole thing is left to dry thoroughly. When this is effected, cut the purflings down level with the surfaces of the back and belly by means of a sharp flat gouge. The defects (if any) will now be brought into prominence, but cannot be remedied. However, we console ourselves that if slight defects exist in our purfling, they exist also, if carefully looked for, in the works of the finest Cremonese masters. Now take a flat file, and rub right round the tops of the edges (left as in Fig. 33), with a view to cleaning them and removing any slight inequalities which may have invaded them since they were last corrected. Now open the spring compass (A, Fig. 10) $\frac{3}{32}$ of an inch, and draw a line all round the edges of the instrument, open them again $\frac{3}{8}$ inch, and draw a second line round the edge inside the first from which it is consequently distant $\frac{7}{24}$. (It will be observed that this operation resembles, in all respects, excepting its measurements, the processes by which we originally sunk the edge, as shown by Fig. 33.) Now take a gouge and sink a trough all round, cutting out the wood (and with it the top of the purfling) about $\frac{1}{24}$ inch deep, being most careful to keep exactly between the lines, and make the hollow quite smooth and even. Lower the wood also at the corners by gouging down between the points of the purfling, so that the sinking round the edge follows the guitar outline of the inside of the fiddle, and throws the corners into that bold relief which is such a beauty in a well-finished fiddle.

When you have gone all round, go all over the ground, bringing the outside and inside edges of the trough exactly true to the marked line all round. Then take the smallest toothed plane (Fig. 9) with the finest and sharpest toothed iron, and plane all round the inside of the groove, so as to melt this trough into the rise of the belly or back (it is, of course, understood that these operations must be repeated on both tables) and bring the edge once more to the curve represented at B, Fig. 33. Now take a sharp scraper and scrape all round where there are any plane or gouge marks, and, indeed, more or less all over the tables, so as to bring it as smooth and clean as it was after the principal scraping set down some time back. Let them be wetted and rescraped two or three times to get them beautifully smooth and soft. They must then be sand-papered three times, beginning with a medium roughness and ending with the finest. Rub the sand-paper up and down the tables the way of the grain, and just round inside the groove you have sunk round the edge. Be careful not to rub on the edge thus left or you will rub it down, especially at the corners, which must be carefully worked into with a corner of sand-paper, so as not to encroach upon the edge at all; but at the same time to clear away the roughness and gouge marks which are almost inevitable at these points. Rub all round and up to the edges of the *f f* holes, but not across them, as it is a great point that the sharp angles made by the surface of the belly and the cutting out of the *f f*'s should be preserved. Between each rubbing wet the surfaces all over with a sponge, and rub them dry directly with a

cloth. When you give it the first or coarsest rubbing, go also all round the sides, which will be by this time pretty considerably dirty. You need, however, only give the ribs one rubbing now, and that with the coarsest of the three papers. For all these operations it is best to hold the fiddle on a *clean* towel spread across the knees.

The next operation is the fixing in of the "rest," or slip of ebony which protects the edge of the fiddle from the pressure exerted by the loop of the tail-piece, and which is represented in position at E, Fig. 52 (Vol. I., p. 395). Take the spring compasses (B, Fig. 10) and opening them $\frac{2}{3}$ inch, mark two points (A, A′, Fig. 46) on the lower edge of the fiddle, $1\frac{1}{3}$ inches apart; *i.e.*, each being measured exactly $\frac{2}{3}$ inch from the centre of the lower bouts. Take as the centre point from which to measure; the joint (purfled or otherwise) of the two lower bouts, not the centre join of the belly (if this latter does not coincide with the former, *i.e.*, it is more important that it should be true to the tail-pin and centre of the lower bouts than to the join of the belly). Now with a sharp thin knife at these two points make two clean cuts (A, A′, Fig. 46) right down to the top of the ribs, but *not* deeper, so as to cut into the ribs. The cuts must extend on the surface just through the purfling, as in Fig. 46, A, A′. Now with a straight-edge and knife connect these two with a straight line, B, B′, which will cover part of the purfling. Draw the knife along this till it is as deep as the other two (A, A′) and then the wood comprised by these lines may be cut and picked out with a knife, leaving a little right-angled chamber formed by the thickness of the belly and the tops of the lower bouts and bottom block, to receive the rest, which may now be cut. If by misadventure in making the cuts, A, A′, the edges get a little split, it must be cut away, and a corresponding slip cut down on the other side, so as to make the cutting though wider still true to the centre join of the ribs and the tail-pin. I need not remark that the cutting must be quite square and perpendicular to the top surface of the bottom block. Now take a little slip of ebony, $1\frac{2}{3}$ inch long by $\frac{2}{3}$ inch broad, and $\frac{2}{3}$ inch deep. Make two sides quite square and true to one another, and adjust the length with plane, file, and knife, so that it just fits tightly into the chamber cut, as in Fig. 46. Never mind about cutting it flush with the edge of the fiddle; this will do when it is fixed round the upper surface, as at D, Fig. 46, and shape off the ends roughly, as at C, Fig. 46. Put plenty of good glue into the chamber, set the roughly finished rest in it, tap it fast with a hammer, so as to fix it, and wipe off the superfluous glue with the brush of warm water, and leave the fiddle to dry. When dry finish it off carefully by cutting it even with the lower edge flush with the belly at the bevelled ends, which last must be exact and equal to one another. Round off the top, so that it is about $\frac{1}{8}$ inch above the edge of the belly. These operations are done with a sharp knife and flat file, the rest as finished must then be scraped quite smooth. Now take a set of files and go right round the edge of both back and belly, making them quite round by filing both corners off the edge, till the line from the under to the upper sides of the edge is a perfectly even curve. When this is done, go round the edges thus rounded and smooth off all file marks with sand-paper of a medium fineness, give the ribs a final thorough sand-papering and the body of your fiddle is finished "in the white," and can be put away out of dust, etc., until the neck and scroll are ready to go on.

(To be continued.)

THE GRINDSTONE: HOW TO SET IT UP.

By W. J. STANFORD.

EVERY workshop should have a grindstone, but, as they are expensive articles to buy complete, I intend to give a few hints, which I hope may enable every amateur to set one up for himself. The most effective plan, I think, would be to give the exact measurements I used, with a few explanatory sketches; but they will only be rough ones, just sufficient to give a general idea of the different parts; and they will not be drawn to scale.

There are several different kinds of stones in general use, and everybody will probably recommend a different one. The common "grey" stone, which is very hard; the "red" stone, which is very soft; the "Nova Scotia," a stone much used for grinding hay knives, etc.; and the "Belston," a stone strongly recommended for grinding edged tools—and that is the one I bought. Messrs. Booth Brothers, *Dublin*, supplied me with one 18 in. in diameter and $2\frac{1}{2}$ in. thick, for 4s. 6d., and I have used it a great deal, and could not desire a better one.

Having bought a stone, the next thing to get is an axle, or shaft, for the stone. Messrs. Booth Brothers, for 5s., supplied me with a set of grindstone trimmings, composed of a pair of friction rollers, an axle and handle, and a hook. They have kindly furnished me with illustrations of them for this article (Figs. 14, 15, 16). The rollers, as shown, are not quite the same as I bought, but would answer equally well. The axle is fitted for working either by hand or treadle power, and the rollers make the stone run so lightly, that, even with a very heavy pressure on, the treadle is quite able to turn it. I hope everyone who makes this stand will get these. The handle and axle, at any

rate, are indispensable, and no blacksmith would be able to make them half as good as these. The rollers are a luxury, but a very useful one. In case anyone prefers to try and make the axle, which is 20 inches long from end to end, the engraving will explain it sufficiently.

Now for the stand. I have made mine out of pitch pine, as it is a very durable wood, and cheaper than red deal. You want—

2 pieces, 3 ft. 4 in. by 3 in.
1 piece, 4 ft. $4\frac{1}{2}$ in. by 1 in.
1 „ 2 ft. 4 in. by 2 in. } 3s.
1 „ 3 ft. 2 in. by 1 in.
4 pieces, 3 ft. 3 in. by 2 in.

Plane up all the above true and square. Take the two pieces, 3 ft. 4 in. by 3 in., and mark one of the 4-in. sides, on each, "Top," and one of the 3-in. sides, "Inside." Out of the piece 2 ft. 4 in. by 2 in. square up two pieces, $10\frac{1}{4}$ in. long, and mark each of these as the two first pieces. For convenience, call the long pieces A and B, and the short ones C and D. Take A, and measure 4 in. from each extreme end, and square a line across. Inside each of these lines mark the breadth of C or D, and square lines across. Square each of these lines on the inside of A. Put B against A, keeping the ends together and the tops uppermost, and square the four lines on the top of B; take A away, and square them on the inside of B.

Set your marking gauge to $1\frac{1}{2}$ in., and on the top of A and B, between the square lines, mark your gauge line from the inside. Set the gauge to the thickness of C or D, and gauging from the top, mark it on the inside of A and B, between the line at each end. Measure $1\frac{1}{2}$ in. exactly from each end of C and D, and square lines across at the top, and square them on all four sides. Now dovetail the four pieces together. Keep to your lines, and make the pieces fit firmly, but not too tight. Put the pieces together,

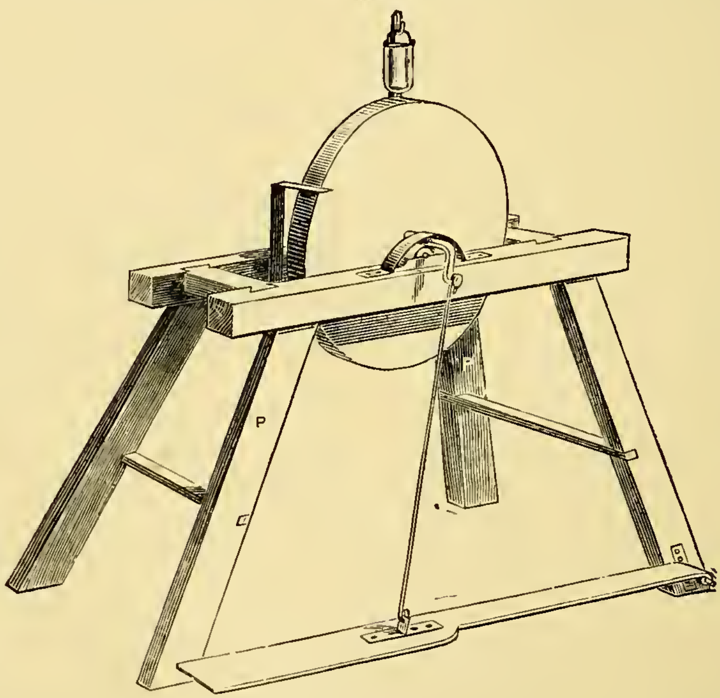


FIG. I.—THE GRINDSTONE, COMPLETE.

and it will appear as Fig. 2. It ought to measure 20 in. by 7 in. inside measurement.

Take the four pieces, 3 ft. 4 in. by 2 in., for the legs. They will have to be mortised into the frame on a slant, to give the legs a splay backwards and outwards, as shown in Fig. 1. If you can determine angles, set your bevel to an angle of 85°; if not, take the frame to pieces, and take A, and lay it on the bench, and put one of the legs against it till you get it to about the slant shown in the figure; hold it with one hand, and with the other draw a pencil line on the leg, underneath A. Set your bevel to this angle. Take A, and 3 in. from one end on the bottom square a line across. Inside that, mark the breadth of the leg, and square a line across. Take the bevel, and from these lines draw by it two lines on the outside, inwards and upwards, and square them across on the top. Set your mortise gauge to 1 in. between the teeth and 1 in. from the fence, and mark it on the bottom from the outside. Keep the teeth the same, but alter it to $1\frac{1}{4}$ in. from the fence, and mark this on the top from the outside. Now cut out the mortise, working carefully from both sides, and you will have the required slant each way. Take one of the legs, and mark one of its 3-in. sides "Outside," and one of its 2-in. sides "Front." With the bevel, mark from the front, on the outside, a line, and square it on to the two 2-in. sides. Set your marking gauge 1 in., and from the outside mark it along from the two narrow sides, to meet the square lines. Sawing from the outside, cut out the tenon, as shown in Fig. 3. (N.B.—Before you cut, be sure your tenon is long enough for the mortise.) In a similar manner mortise the three other legs into their places. Remember that only the legs at the opposite corners will have the same slant. For instance, Fig. 3, as shown, would only fit the legs marked P, P, in Fig. 1. You will see, when you come to do it, by trying the legs against

the frame. Put in all the legs, and turn the frame upside down. With a lath, mark your legs all the same length, and with the bevel, mark them, so as to make them stand evenly on the ground, taking care not to mark them the wrong way. Take them out and piece will keep them in their places, and prevent them from springing. Fit them in tightly, and drive in a nail at each end. Now the stand is finished.

Now screw the friction rollers exactly in the centre of the stand; if they are not exactly parallel, the stone

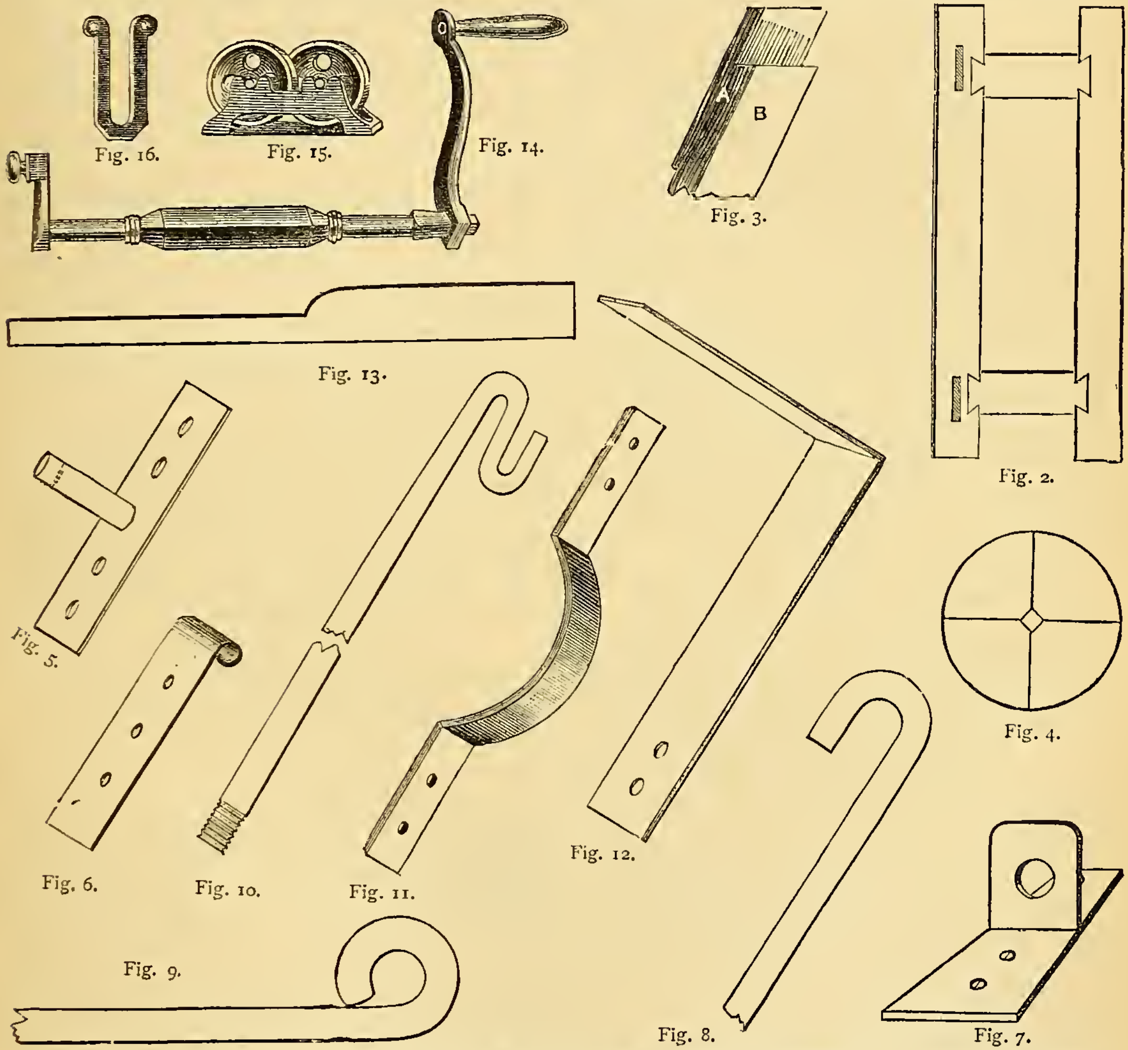


FIG. 2.—PLAN OF STAND. FIG. 3.—MODE OF CUTTING TENON IN LEG (A, front; B, outside). FIG. 4.—LINES SQUARED ON FACE OF STONE. FIG. 5.—PLATE OF IRON WITH SPUD. FIG. 6.—PLATE OF IRON TO FIT SPUD. FIG. 7.—PLATE OF IRON WITH EYE. FIGS. 8, 9.—CONNECTING ROD FOR TREADLE. FIG. 10.—ROD WITH SCREW THREAD AT END. FIG. 11.—GUARD OF IRON. FIG. 12.—REST. FIG. 13.—TREADLE. FIG. 14.—AXLE. FIG. 15.—FRICTION ROLLERS. FIG. 16.—HOOK.

cut them. Put the dovetails together with white lead, and drive a 3-in. screw into each of them, from underneath. Put in the legs also with white lead, and wedge them up. Take the piece, 3 ft. 2 in. by 1 in., cut in two, and halve it in from the back at each end, 14 in. from the ground. The design explains it sufficiently. The legs ought to be 11$\frac{3}{8}$ in. apart at the top, and 14 in. at the bottom. This will never run true. On the stone, exactly through the centre, draw two pencil lines at right angles, as shown in Fig. 4. This can be done by finding the four points with a compass. Square these lines on to the face of the stone. Put the axle into the stone, and fill it up to the centre of the stone with flat pieces or red deal. Put axle and stone on to the rollers. Have some red deal thin wedges made. And now your

work begins. Keep the stone slowly turning, holding against the stone your rule, and drive in wedges from both sides of the stone, on the four sides of the axle, and also at the four corners. The stone has to be true two ways, so try it on the side as well as the front. It requires time and patience, but it can be done. When you have it as true as the stone will allow, cut off the wedges, put on the handle, and get some one to turn. Get an old plane iron or a well-tempered piece of steel, and resting it on the stand, hold it close to the face of the stone. Keep the stone dry, and set it going. Work more on the edges than the centre, so as not to hollow out the stone. Do not mind wasting the stone or your time, but keep at it till you have the stone perfectly true and smooth. Now your stone will do for ordinary work; but I have put a treadle on to mine, as in the design. Do not put on a trough, for unless you contrive, as some people do, a plan for raising and lowering the trough, the side (and it will always be the same side) which lies in the water will soften and pick off. A can overhead is the best plan. Messrs. Booth Brothers supply very nice cans at 2s. 6d., and cheaper ones at 1s. I bought a 1s. one; but a meat tin, with a fine hole drilled in the bottom, will do. Get a blacksmith to make a set of fittings, like those shown in the drawing, or, if you can, make them yourself. They will cost about 3s.

Fig. 5 is a plate of $\frac{1}{4}$ in. iron, 7 in. by $1\frac{3}{4}$ in., with four screw holes in it, and with a spud 3 in. long riveted in the centre, at the end of which a small pin-hole has been drilled. Fig. 6 is a plate of $\frac{1}{4}$ in. iron, 7 in. by $1\frac{3}{4}$ in, with three screw holes in it, bent round to an eye, to fit the spud very tightly.

Fig. 7 is a plate of $\frac{1}{4}$ in. iron, 5 in. by 1 in., with four screw holes and a plate, with an eye in it, riveted in the centre, as shown.

Figs. 8 and 9 are the connecting rod for the treadle, made out of $\frac{3}{8}$ in. round iron, about 36 in. long, bent to a hook at one end, and to an eye (to which Fig. 7 has to be attached) at the other. Fig. 10 is a rod of $\frac{1}{4}$ in. round iron, about 34 in. long, bent as shown in the figure, with a screw thread at the end.

Fig. 11 is a guard of $\frac{1}{4}$ in. iron, 17 in. by 1 in., with four screw holes, bent, as shown in the figure, which passes over axle and rollers, and screws to the stand. This must be made carefully, just to shave the axle but well clear of the rollers. Take one of the rollers to the blacksmith, and he will make it all right. You will require two. Fig. 12 is a rest, made out of $\frac{1}{4}$ in. iron, 15 in. by $1\frac{3}{4}$ in., bent as shown, at 9 in. from one end, with two screw holes.

Now to connect them all. Take the piece 4 ft. $4\frac{1}{2}$ in. by 1 in., and cut it as shown in Fig. 13, half of it the full width, and the other half $2\frac{1}{2}$ in. wide. About $\frac{1}{2}$ in. from the bottom of one of the right side legs, screw Fig. 5. Underneath the treadle, at the narrow end, screw Fig. 6. Hang the connecting rod on to the axle. Fix the treadle on the spud, and raise it about 1 in. from the ground; bring the rod and eye forward till it meets the treadle, mark it, and screw it on. The length of the rod, of course, is an essential point, and will depend on the height of the top of the stand from the ground. My stand is 34 in. high, and my rod measures 30 in. from the inside of the hook to the inside of the eye, but it must be determined by bending a piece of wire to the necessary length. Screw on the guards over the rollers. The hook supplied with the rollers may, if desired, be hung over the axle, on the handle side, and screwed to the wood, and the guards dispensed with, but the guards are preferable. Screw the support for the can into the stand, on the handle side, between the rollers and the stone. Screw on the rest, so that the short arm just shaves the stone. A water guard made out of back-board may, if wished for, be tacked on under the rest at one end, and one to match it at the other, but they are not essential unless you have a trough.

Your work is now done, and if you keep the frictional parts well oiled, and always empty the can when you have done working, and not let it drip on the stone, you will have a stone that will last your lifetime, and a stand that will last at least a second generation, at a cost of about 15s.

BRAZING AND SOLDERING.

By GEORGE EDWINSON.

V.—BRAZING HEAVY JOINTS.

IN the former chapters of this series I have shown how to braze and solder small and light joints by means of the heat from a soldering-iron, and a flame urged by a blast from the mouth blow-pipe. Whilst we use soft solder, any joint, however long, may be made in tin, zinc, or thin brass articles, and the soldering iron may be used as a source of heat. We may also hard braze or hard solder any small articles by heating up the work with the mouth blow-pipe; but when large articles and heavy joints in brass, copper, and iron have to be hard soldered, it will be found impossible to heat them up with the mouth blow-pipe. We must, therefore, seek another method by which the work can be heated.

In recommending the various sources of heat at the command of my readers, I shall suppose them able to choose that which may be deemed suitable to their several requirements, and to adapt each or any of the methods herein mentioned to the work in hand,

Herein many amateur workmen show themselves superior to their professional brethren; for some of the latter, having been carefully nursed to use convenient tools and appliances, find themselves lost when separated from their usual tools, and are unable to work without them. The amateur smith and metal-worker, for instance, will turn out a strong if clumsy job with metal heated up in a kitchen fire, urged to the proper heat with the domestic bellows. With a bunch of old rag in lieu of tongs, a piece of a plough-beam, an old cog-wheel, a lump of cast iron, or, perhaps, only a hard stone for an anvil, he will fashion his hot iron to his will, punch holes when he cannot drill them, and grind down all roughnesses with a grindstone.

Persons with such a natural aptitude for metal-working may attempt hard soldering and brazing as a means for uniting joints, when welding them by the usual means might be deemed impracticable. To such it will be a pleasure to know that a kitchen fire, urged to the proper heat with the common domestic bellows, will be found to give all the heat necessary for brazing tolerably heavy joints, and that the glowing embers of a strong wood fire, such as that from sound oak, will be found to be the best fuel, excepting that of charcoal itself. This being clearly understood, they will only have to select a fireplace suitable to the length and size of the article to be brazed, and then follow the ensuing instructions.

First, see to it that the joint is of a proper shape for brazing. In most instances, the butt joint (Fig. 28) will be found unsuitable where strength is required. The scarfed or lap joint (Fig. 29), or a fracture having a scarfed shape, may be easily brazed, and will form a tolerably strong joint. Where the scarf is broad and long, or when we have a long seam to braze, as in the two edges of an iron plate, it may be prudent to drill a hole or two through the parts, and to insert a few rivets, for the purpose of holding the scarf or the seam well together; but rivet-holes should be avoided as much as possible, because they take out material and weaken the joint. And when it is found necessary to drill holes, they should be as small as possible. The grooved and tongued joint (Fig. 30) will be found the neatest and strongest of all, and, in most cases, may be made without the addition of a rivet, if clamps and other means are adopted to keep the tongue well into the groove whilst the work is being heated. The tongue and socket-joint may be included in this class, and also the dovetailed (Fig. 31) and the slotted joint, the last two being only admissible when we have enough material to back up the cuts, and thus make a sound joint. When cylinders of thin metal have to be strongly brazed, and objections are raised to a lap-joint, we may have recourse to the serrated joint, or the edges of the metal cut into teeth, like a saw, the teeth being made to fit into each other; or the gaps in the edges may take the form of dovetailing, and thus ensure additional strength. Other shapes are shown in Figs. 32, 33, 34.

The next consideration, after the shape of the joint, is that of its preparation for brazing. I need scarcely mention that both parts of the joint must be made perfectly bright and clean, free from rust, and grease, and dirt. We must also see to it that the parts are perfectly fitted, for a perfectly close-fitting joint will be the only strong one. Readers of the article on "Velocipedes: their Construction and Use," will remember that Mr. Stephenson has been very particular in urging a close fit for a joint that has to be brazed. The same care should be bestowed on all joints, whether for use on a velocipede or not, bearing in mind at all times that in metal-work, as in wood-work, the thinnest film of the cementing substance makes the strongest joint. It is only the botcher who fills up his badly-fitting joints with putty, cement, or solder.

Having got the parts fitted closely together and made bright, we must next make a thin paste of borax and water, and thinly coat all the parts with the mixture, applying it with a feather. Again put them together, and bind all firmly with iron binding wire, but leave the seams of the joint uncovered. The object of this is to keep all parts of the joint firmly in contact whilst they are being made hot, and to keep them in their proper position; for if they shift only a little at the critical moment when the brass begins to run, we shall find the job spoilt and the parts out of truth. As there will be a probable tendency of the parts to alter their position consequent upon the expansion of the metal in heating, and also the shrinkage of the supporting bed of fuel as it burns away, we must firmly secure the parts not only from transverse shifting, but also from longitudinal slipping, and may, therefore, find it necessary to bind on another piece of iron or pieces of iron on each side of the joint, or to contrive a clamp for the purpose. It is here that a rivet or two becomes useful, and, providing the holes are drilled small, little objection can be offered. Iron wire is used in preference to that of any other metal, because it is infusible at a temperature that would melt copper wire.

Although every precaution has been taken to ensure the joint remaining firm in its proper position all through the operation, it will be well to add the further precaution of having a firm bed of fuel as a support for the joint. We should, therefore, rest the joint on a glowing oak or other hardwood log, and pile the glowing coals around it; but previous to the act of laying the joint on the fire, we must apply the solder. This may be any one of the first three hard

solders mentioned in my third article, p. 279, or a bit of common brass or brass wire may be attempted, if brazing spelter or hard solder cannot be got. Cut up the solder or brass into thin strips about $\frac{1}{8}$ in. wide and $\frac{1}{4}$ in. long, arrange these along the seam, and stick them there with a bit of the borax paste. When all have been arranged, put the joint carefully into the prepared fire, and get a friend to help, by blowing the bellows, whilst you arrange the coals around the joint with a pair of tongs. Direct the blast of the bellows on the log just below the joint, and thus make the flame spout up and around the article. Heat up gently on both sides of the seam until the iron is red hot, then urge the blast near the seam to make it hotter at that point, and stand by during the operation, with a pointed iron rod, to rearrange any bits of brass spelter that may be displaced by the swelling borax. A bluish flame will announce the fusion of the spelter; it will then tremble, and sink into the seam, when the blowing may be stopped, and the article allowed to cool slowly down. I need scarcely warn the amateur not to take the article out of the fire at once, nor to cool it in water, for it is well known that suddenly cooled iron is hard and brittle, and this applies equally to a brazed joint.

The subsequent treatment of filing and polishing the joint does not require to be detailed here, but will be understood and done as a matter of course.

I will now turn my attention to the selection of other sources of heat beside that of the domestic wood fire, and thus endeavour to assist all readers desirous of attempting a little brazing at home.

It must be understood that a blast of some kind is absolutely necessary in heating up the work; and, for large articles or heavy joints, the blast from a mouth blow-pipe is insufficient. The domestic bellows may be used with proper fuel, but the blast from it is of a too jerky character for successful use with gaseous fuel, such as gas or oil flames. Specially constructed bellows or blowers, to be worked by the foot, are made and sold for the purpose of obtaining a continuous blast to feed the mechanical blow-pipe. Amongst the best and cheapest may be mentioned those made by Mr. Fletcher, of *Warrington*, and sold by him and his agents in England and the Colonies. The sizes and prices of these blowers are:

No.	Size over all.	Pressure in inches.	Pressure in ounces.	Size of air-pipe.	Price.
3.	13 by 10 by $6\frac{1}{2}$ deep	30 in.	20 on sq. in.	$\frac{3}{8}$ in.	17s. 6d., 22s.
5.	15 by 12 by 7 ,,	30 ,,	20 ,,	$\frac{7}{8}$,,	22s. 6d., 30s.

The higher priced blowers of each number are mounted on iron frames, with feet to support the blowers. The same maker supplies suitable blow-pipes for brazing as under:—

1. Hand blow-pipe, without taps, blower No. 3, interchangeable jets, price 4s. 6d.
2. Hand blow-pipe, without taps, blower No. 5, $\frac{5}{8}$ gas and $\frac{1}{4}$ in. air-jet, price 4s. 6d.
3. Hand blow-pipe, air and gas taps, blower No. 3 or 5, both fixed or interchangeable, price 7s.

The numbers are my own, inserted to facilitate reference.

No. 1 blow-pipe is made with a portable nozzle, arranged to unscrew for the interchange of jets. These can be had in four sizes, at 4d. each extra. This tool may be used with a No. 3 blower to braze all fine work up to $\frac{1}{2}$-inch brass tubing. The No. 2 blow-pipe is used for large and heavy joints with a No. 5 blower. Both of these tools are fitted with flexible rubber tubing of clear bore, free from wire, and the two tubes are held in one hand (see Fig. 39), the air-tube resting on the knuckle of the little finger, the next finger interposed between the two tubes, the middle finger resting on the gas-tube, and the pipe itself held between the first finger and thumb. When held thus, the air and gas supply can be controlled to a nicety, and thus the heat determined at will; but it will be found convenient to have taps fitted to the tubes, even at the additional cost shown at No. 3.

In Mr. Fletcher's pamphlet on "The Use of the Blow-pipe," he gives the following instructions for the guidance of those who may wish to make their own blow-pipes:—"In the construction of blow-pipes for gas, they should be so proportioned as to give the maximum effect for the minimum of fuel and blast. To do this, the air-pressure available must be an important factor. Speaking roughly, but still sufficiently near to make a correct rule to work by, a blow-pipe requires one of gas to eight of air. If the gas is supplied at a pressure equal to 1 inch of water, and the air at eight times that pressure, the area of the gas and air-pipes should be equal, to get the best effect. If the air supply is equal to 16 inches of water pressure, the gas-pipe must be double the area of the air, and so on in proportion. Of course, the air and gas supplies can be adjusted by taps easily, but in the first construction of a blow-pipe for large work this rule must be adhered to. Any departure from it reduces the power of the blow-pipe, and ignorance of this simple rule has frequently caused failures, which the makers of blow-pipes have been unable to explain. It is often an advantage to build up a blow-pipe quickly for some special work, and the method and rules for construction are here given, bearing in mind always that a high pressure blast gives the most compact and highest temperature flame, without having actually any greater *quantity* of heat in the flame produced." If the pressure in the gas-pipes is such as to supply 75 cubic feet of gas per hour through a $\frac{1}{2}$-inch bore gas-pipe, we shall require an air supply of 10 cubic feet per minute to properly burn this gas in a

blow-pipe, and the air-jet must be arranged accordingly.

Following the rules given, a blow-pipe for rough, heavy work can be easily improvised out of a few stock gas-fittings. Figs. 35 and 36 show how such a blow-pipe can be constructed out of a few bits of pipe. We sball want three 3-inch lengths of ½-inch gas-pipe, each screwed at one end, one T-piece and one elbow to fit, one nipple to connect elbow with T-piece, one plug, and one 4½-inch length of ¼-inch pipe. File off tbe head of tbe plug, drill and tap a hole in it, and fit therein one end of the ¼-inch pipe. Then screw plug and pipe into one end of the T-piece as shown; this may be done by gripping the nose of the small pipe in a vice after it has been passed through the T-piece, and turning this piece around. Next screw in the air-pipe, then the nose-pipe, and see that the small air-jet comes into the position marked on sketch, then put on elbow and short pipe for gas, and, finally, connect up the tool to air and gas supply by two lengths of clear-way rubber tube without wire. The air-jet may be screwed into a diminishing socket, and this attached to the T-piece, if found more convenient than drilling and tapping a plug. Large clear-way cocks may be used to regulate the supply of gas and air, but it is usual to grip the rubber-pipes between the fingers, as before mentioned, and thus regulate the supply. Suitable rubber tube costs from 9d. to 1s. per foot.

FIG. 28. BUTT JOINT.

FIG. 29. LAP JOINT.

FIG. 30. TANG AND SLOT JOINT.

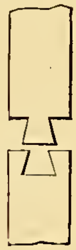


FIG. 31. DOVETAILED JOINT.

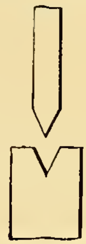


FIG. 32. POINT AND NOTCH JOINT.

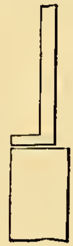


FIG. 33. FOOT JOINT.

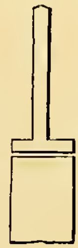


FIG. 34. T JOINT.

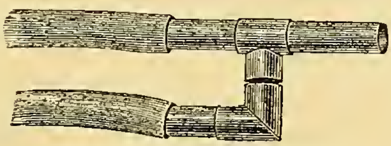


FIG. 35.—IMPROVISED BLOWPIPE.

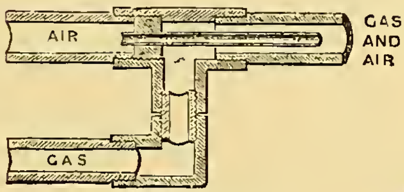


FIG. 36.—IMPROVISED BLOWPIPE, IN SECTION.

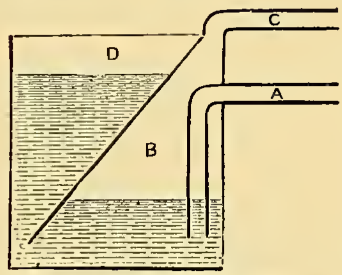


FIG. 37.—AIR RESERVOIR FOR CONTINUOUS BLAST.

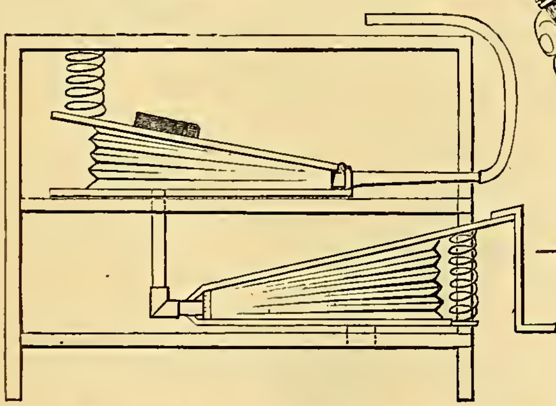


FIG. 38.—SKETCH S OWING HOW TO MAKE IMPROVISED FOOT BLOWER FROM HOUSE BELLOWS.

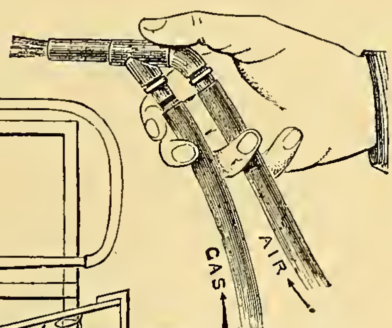


FIG. 39.—DIAGRAM SHOWING HOW TO HOLD A BLOWPIPE.

As in some districts foot-blowers may not be readily obtained, and no means of getting a continuous air supply for the blow-pipe to be had, it will be well to give readers a hint or two on making or improvising substitutes for the apparatus. The first hint is borrowed from Mr. Fletcher's pamphlet on "The Use of the Blow-pipe," and is illustrated by Fig. 37. It consists of a square tin or box (air-tight, of course, at all its seams) of, say, 1 foot square by 18 inches in height. Divide it into two equal parts by a sloping partition, and fit an outlet pipe, C, near the top; just below this fit another pipe, A, bent as shown to act as an inlet pipe. This should be fixed before the partition is soldered in. When the pipes have been fixed, half fill the reservoir with water, stop the outlet, C, and blow air in at A. The air will bubble up through the water, fill the division, B, and drive some of the water into D. Now open C, then the

weight of water in D will drive the air out of B in a constant stream; and this will be kept up as long as we blow air in by the pipe, A, for the water will act as a valve in preventing the air to return through A.

Another hint given in the same pamphlet, but worked out by myself, is illustrated by the sketch, Fig. 38, which shows two pairs of house-bellows mounted in a wooden frame, and arranged for one to act as the blower, and the other as the continuous-pressure reservoir.

The upper (and also the lower) pair of bellows must be of good quality, and perfectly air-tight when the nozzle is stopped by the finger. This being proved, remove the valve or clapper, plug the hole air-tight, and fit in the plug a short piece of gas-pipe. Place this pair in the position shown in sketch, and either put a heavy weight on the top or connect the top handle with a spring having a downward pressure from the frame above. The nozzle of the lower pair of bellows must be removed, and its place supplied with a bit of gas-pipe; this must be connected by an elbow with the short length of pipe depending from the upper pair of bellows. This lower pair of bellows must be fitted with a spring having a contrary action to that of the spring over the top pair—that is to say, it must be so fixed between the handles of the bellows as to keep them always open when not pressed down. A piece of flat iron $\frac{3}{8}$ inch thick, by 2 inches wide, by 1 foot long, bent over at one end to the length of 2 inches, and at the other end 3 inches in the opposite direction, will serve as a step for the foot depending from the top handle of the bellows. The short angle must have three holes drilled in it, and by these screwed on to the upper part of the bellows handle. A piece of rubber tube fastened to the nozzle of the upper pair to connect this with blow-pipe will render the apparatus complete. The lower pair of bellows worked by the foot will pump air into the upper pair; these will be filled with air under pressure whilst the rubber tube is stopped, pressure being applied by the weight or the spring on the upper pair, this will give a continuous blast to the blow-pipe.

Coal-gas is an excellent fuel for the blow-pipe when acting on copper and its numerous alloys, but it is not equally valuable in the operations of melting and brazing iron and steel. Indeed, it is not at all suitable for fine steel work, since its use seems to make the metal harsh and brittle. But in such cases, where these metals have to be brazed, we can use gas fuel together with coke or charcoal to get up a fire for brazing, or even to heat up the work, providing the gas flame is not allowed to strike on the metal, but into the fuel below the metal. Where coal-gas cannot be had we may still have recourse to gaseous fuel for the blow-pipe, obtained from the vapour of gasoline, or benzoline, or spirit petroleum. Apparatus suitable to the generation of gaseous fuel may be had from Mr. Fletcher, of *Warrington*, or his agents, at prices ranging from £1 7s. 6d. to £2. A sketch of this apparatus, together with a blower, was given on p. 185, Vol. I. Fuel from this apparatus, or gaseous fuel from coal-gas, may be used together with coke in a smith's forge by a little attention on the part of the workman. The ordinary foot-blower and rough blow-pipe is used, and the jet of flame injected through the *tuyère* when the nozzle of the ordinary bellows has been removed. Small portable forges are easily adapted to the purpose. Heap up some broken coke in front of the *tuyère*, light the blow-pipe, and inject the flame through the *tuyère* from the back into the coke, this will light up the coke, then turn out the gas and use the air-blast for a minute, again turn on enough gas to just brighten the fire, and thus raise the heat.

Of course, it is well known that the smith's forge may be used in the ordinary way to heat up work for brazing, and also to finish heavy joints without any other kind of blow-pipe, but in preparing work for this fixed air-blast we must remember that the joint must be turned to the blast as required since the blast cannot be directed to the work as in a portable blow-pipe. Be careful to have a clean fire of coke or of coal, and to avoid all fuel that gives off sulphur in burning. The spelter or solder, the flux, and the method of preparing and manipulating the joint is the same for this fuel as for others; in fact, the principles already given only require application to be suitable to all kinds of brazing and soldering.

In my next I hope to treat of welding, or soldering metals under heat by themselves alone, without the aid of another metal.

(*To be continued.*)

WRINKLES FOR AMATEURS.

By VARIOUS HANDS.

XI.—A FEW WORDS ABOUT FRENCH POLISHING.

[*From PROGRESS.*]

I NOTICED that although much has been said from time to time in AMATEUR WORK with regard to the preparation of wood for French polishing, and the process itself, that even now correspondents are frequently asking for instructions. I have therefore committed to paper the following notes on the methods which I myself have used for some time for finishing articles of furniture, etc., in this manner, with the hope that the processes described may prove as useful to others as they have been to me.

Preparing the Wood.—Sand-paper the wood perfectly smooth, then with the finger rub in the following filling—Melt a little of the best engine tallow, and mix with it plaster of Paris and burnt umber (let the two latter be thoroughly mixed together first), make it pretty stiff; if a fair quantity is made it goes quite hard when cold, but on putting into a hot oven softens again for use. After you have rubbed it in all over, let it thoroughly set, which will take about a couple of hours, in a cool place, then scrape the surplus off, and rub thoroughly smooth with soft paper, it is then ready for a coating of raw linseed oil; this requires about forty-eight hours to set, and as the amateur has generally a few things going on at the same time, this will be no inconvenience, and it is none the worse for remaining a day or two longer.

French Polishing.—Procure two bottles, *thoroughly dry* (this is essential), and go to an oil merchant, or, better still, a vendor of varnishes only, if you happen to have one in your town, and get four penny worth of white polish, and four penny worth of French polish, both the best. You then require cotton wool and fine muslin; the latter is generally plentiful in most households, as it does not matter in the least if it has been used for curtains, etc. Then,

1st. Rub your wood with a ball of soft paper for a few seconds, this prepares a beautiful surface; after which get a piece of cotton wool and form to the shape and size of a marble, soak with the white polish, and put inside a piece of muslin, rub gently all over your wood, taking care that you get a good coating all over; if your pad gets dry before you have gone all over, apply more white polish to the cotton wool; then get another piece of cotton wool, and do exactly the same with the French polish, giving it three or four coats; then repeat the process with the white polish, you will soon find a splendid polish appear.

Caution.—Always let one coat of polish dry before you apply another; for this reason it is better to polish two or three articles at once, as by the time you have finished the last the first is dry and ready for another coat. If it becomes sticky apply a little raw linseed oil to the pad with the finger, *not too much.*

Directly the muslin begins to ravel on the under side of the pad, remove the wool to a fresh place, or you will rope your surface.

Lastly.—Do not put a heavy hand on, but rub as lightly as you possibly can. If these directions are implicitly followed, you will attain a beautiful polish with very little labour.

XII.—SUBSTITUTE FOR REED PLANE.

[*From W. SMITH.*]

I OBSERVED on page 434, Vol. I., of AMATEUR WORK, in replying to inquiries as to how the reeds on the edges of the shelf were done, you answered by a reed plane, which costs, etc.

Now I have an interest in seeing your paper supplying amateurs with the how to do, and that as cheaply as possible. I therefore send you a rough sketch of a handy thing to do the same thing, which the amateur can make himself, as three or four shillings are perhaps an obstacle with some amateurs trying their hands at cabinet-making. Besides, this tool can go into and round shaped work as well as on the straight, which is an advantage over the plane. Besides, the amateur can make a number of cutters to any pattern of moulding. The tool requires some practice to work, and so does a plane.

In a good few shops I have worked where there is no machine; the mouldings were run with this if a plane of the shape of the moulding required was not at hand. But to explain the sketch in Fig. 17.

Cut a piece of beech or birch, 7 inches long by 2 inches broad by 1 inch thick. Cut it to shape, then cut a saw draught up as far as A, bore holes for screws. Then get a piece of saw-blade, or thin steel, shape it with a file to the desired shape of moulding wanted, or rather to the reverse shape; it must be filed truly square across the edge, as it scrapes the shavings off either way; the same as a plane, it is worked with both hands; the shelf being fixed in the bench, screw the part B in the fence to guide it along.

XIII.—"OVER-DOOR" IN FRETWORK.

[*From ROSELEA.*]

I HAVE no doubt that many amateurs in fretwork have, like myself, grown somewhat tired of the never-ending frame, or bracket, or card-tray, and have felt a desire to do something larger and at least as ornamental and useful. For such I send the accompanying design for an ornament over the ordinary doorway. In most houses the door frame is anything but artistic, its only adorning being the thin moulding run round it. In mansions of any pretension, various methods are adopted to break the hard uniformity of the straight-lined rectangle we call a door; but most of these are beyond the ordinary amateur's work. This attempt of mine is, I may say, quite within any amateur's reach, even with the ordinary fret-saw frame, or bow saw. With this instrument I have cut six similar to the accompanying design in Fig. 18; and placed them above the doorways in my lobby, much to its improvement.

They are cut in $\frac{3}{4}$-inch common yellow pine, free from knots, and as my doors are grained oak, they are grained of the same shade and style. The wood is all in one piece, with the exception of the "finial" at top of centre, but this is not absolutely necessary. The round holes, between the cut dashes, necessary to

give lightness, are cut by a centre-bit, and of course should be all about equidistant from each other. In the centre can be put a plaque, a medallion in plaster, or a carved coat-of-arms. In my own case I have used medallions of the poets—white on a pale blue ground. Round this centre opening I ran a raised moulding, to give it more of a picture-frame appearance. This moulding runs into a slight ornament at top, and at bottom is an ornamental shield, which comes over door frame for an inch or so, and serves to keep the whole piece from being pushed too far back. It is all fastened to the door frame by screws, two or four being quite sufficient. About half-an-inch is left at bottom of fretwork for the purpose of fastening. These screws are shown in drawings. In one or two I have varied the design slightly, substituting my monogram on each side of centre oval, making it occupy centre of second ovals. If the centre opening be bevelled inwards with a grooved bevel, and this bevel be gilt, it will much improve the appearance of the plaque or medallion.

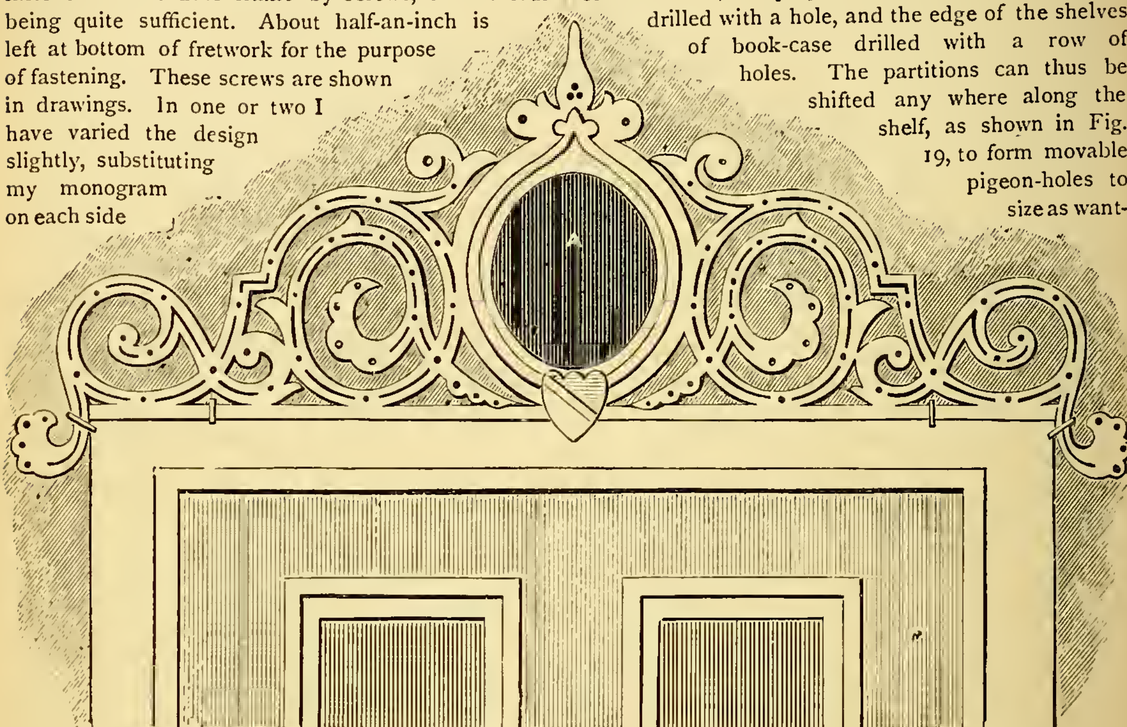


FIG. 18.—OVERDOOR IN FRETWORK, BY ROSELEA.

XIV.—BOOK-SHELF FOR UNBOUND SERIALS.

[*From J. W. KING.*]

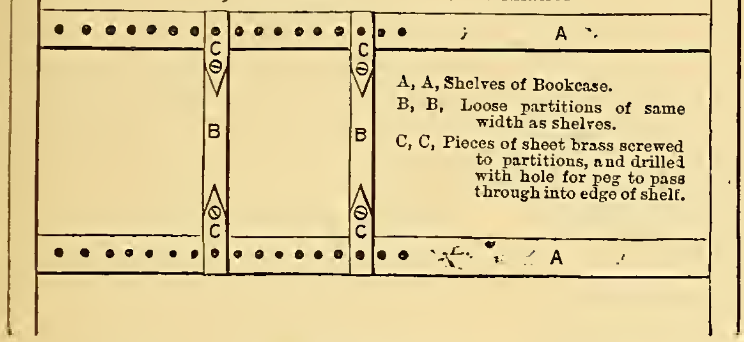
I HAVE found it a great trouble to keep loose periodicals and magazines tidy, and at the same time, easily available for reference; they will not stand on end like bound books, and to lay them down in separate piles, when you have, as I do, about a dozen weekly, and as many monthly, takes up too much room. To get over this difficulty, I invented the following plan, which answers admirably, and I trust will be found of service to others: Get several pieces of wood to match the shelves, and to fit easily, but closely, in the space between the shelf which you intend to use for magazines, etc., and the one next above (these pieces of wood must fit close to back of book-shelves, and be flush with the front edges; they are to form movable partitions to separate each kind of magazine). Fix on both ends of the front edge of each piece of wood, a piece of sheet-brass, allowing it to project the same distance at each end, as the thickness of the shelves of book-case; the projecting piece of brass is to be drilled with a hole, and the edge of the shelves of book-case drilled with a row of holes. The partitions can thus be shifted any where along the shelf, as shown in Fig. 19, to form movable pigeon-holes to size as wanted, and brass pins through the hole, in brass, into the hole in shelf, will fix in any place.

XV.—A BOOT AND SHOE RACK.

[*From FRANCIS SPENCER.*]

A LOT of boots and shoes on the floor look untidy, and don't keep themselves in pairs—so here is a cheap contrivance which is practicable for anyone who has a saw, a plane, and a hammer handy. A few slips of wood from an empty packing-case will supply the wood, so a few nails and the requisite number of tenter-hooks (tinned), complete the list of materials; and, as the job does not require delicate work, it need not take much time. I got my idea on seeing a saw-edged brass and wood arrangement on sale at a shoe-

FIG. 19.—BOOK-SHELF FOR UNBOUND SERIALS.



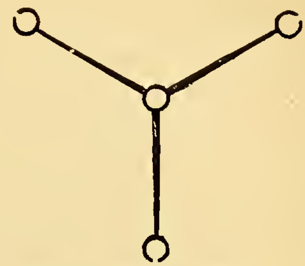


FIG. 23.—BRACING IRON.

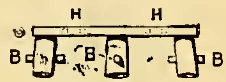


FIG. 26.—ELEVATION OF LOWER RING.

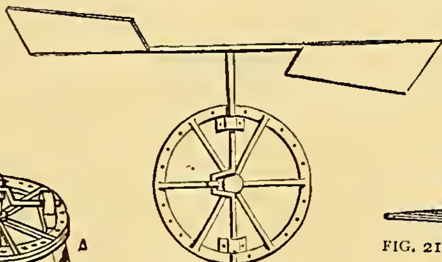


FIG. 24.—PLAN OF TOP OF WINDMILL.

FIG. 21.—TENTER HOOK.

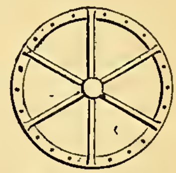
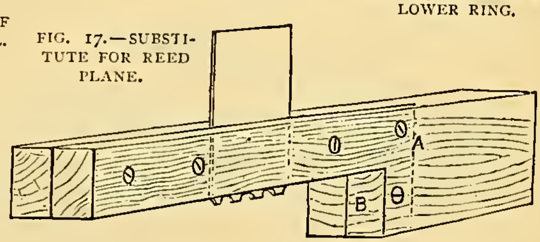


FIG. 25. — PLAN OF LOWER RING.

FIG. 17.—SUBSTITUTE FOR REED PLANE.



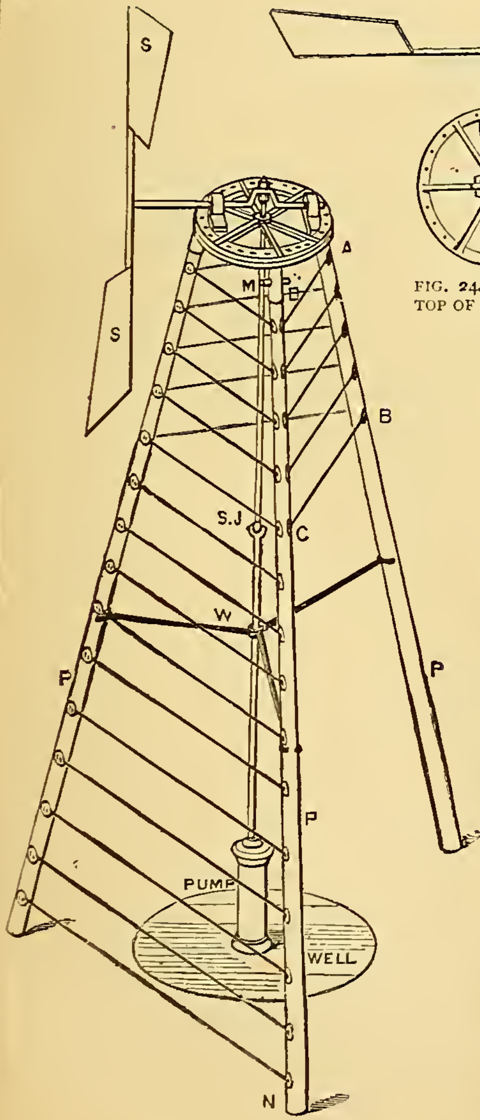


FIG. 22.—SMALL WINDMILL.

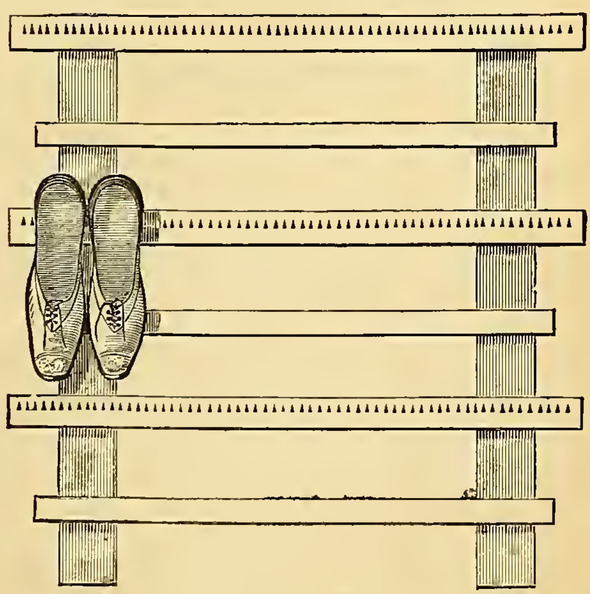


FIG. 20.—BOOT AND SHOE RACK.

shop—price much too high for my pocket. So buying the tenter-hooks (Fig. 21) for a few pence, I set to work next day and made my frame (Fig. 20), holding three times as many pairs of boots and shoes as that in the shop, the price of which was 13s. The illustration requires little explanation, being drawn to scale. One thing needs care—choose for the tenter-hooks a soft kind of wood, for driving the hooks so near each other, in a row, is apt to split some timber. Birch or spruce are likely to give way. A portrait still exists in our family of a very peculiar old gentleman of Newcastle —long ago departed from this world; in fact, when a boy he piloted the Pretender across the moors. Amongst other curious ways, he had a fad about his shoes, always ordering three shoes instead of two pairs. They were made straight, so that each could be worn on either foot. He argued that these would wear as long as two pairs—giving each shoe a day's rest in turn. One of his reasons that shoes should rest, and dry slowly, is in accord with this boot-rack. On it the shoes can be thoroughly dried, being so completely exposed to the air. The boot-rack does not need to be fastened to the wall, but may lean against it from the floor.

XVII.—A SMALL WINDMILL.

[*From T. E. R., Teddington.*]

WITH reference to the small windmills that are commonly used in many parts of the United States, I may say that I made a small one for my own use, some few years ago, and I will now try to give as clear a description of it as I can. I had a well dug in a field, near my house. I then covered the top over with wood, and fixed a small garden force-pump on the top; the price of the pump was £1. I then bought three good scaffolding poles, and fixed them in the ground, pyramid fashion, about six feet apart at bottom, and two feet at the top. I got a blacksmith to make me some thirty small round iron rods, flattened at each end, with two screw holes, and these I screwed on from the bottom, at about one foot apart, to form steps to go up to the top when necessary to turn the head of the mill round, and also to keep it all firm together. The iron rods, A D', B C, etc., in Fig. 22, are put on all round, so as to get to the top of the mill, no matter which way it faces. At W is an iron, as in Fig. 23, which braces all poles together. From M to N rods go from top to bottom, to form steps to top, to turn head round and oil shaft. In Fig. 24, which is a plan of the top, are holes all round; this is to enable the four sweeps to face in any direction of the wind. One bolt is enough to go through one pair of holes. You can go up the iron stays to shift the head. In Fig. 25 is the plan, and in Fig. 26 the elevation of the under iron ring, showing the three sockets to fix it to the poles. The four sweeps (S, S, Fig. 22), are made of canvas, well tacked on, and painted with three coats of common paint. I found this a very cheap and good pump; it pumped the water out of the well to a cistern at the top of my house, about forty feet. I trust my readers will understand my very rough sketches. The two rings at the top are of flat iron, $1\frac{1}{2}$ in. wide and $\frac{3}{8}$ in. thick, with corresponding holes in both every three inches.

PRINTING FOR AMATEURS.

By A PRACTICAL PRINTER.

IV.—DISPOSITION OF MATERIAL IN CASES.

WE must now turn our attention to putting our amateur printing-office in order, allotting to each article its duly-appointed place; for in no business is it more important to have "a place for everything and everything in its proper place." Assuming that the various material has been ordered and delivered, and now lies before you, in company with any home-made articles or substitutes, the first thing to do, is to roughly sort the articles in the order in which they will be required. Thus, on the imposing table lay out the unopened packets or founts of type in their paper and string coverings, with a drawer or box arrange the quoins, furniture, reglet, etc. Then setting up your composing frame in a position where light will best fall upon it, select a case, or pair of cases, suitable for the reception of the first fount of type you intend to put in case. Here the first difficulty meets the young compositor, for it is now absolutely necessary that he should acquaint himself with the position of the "box" in which each letter and sign is invariably deposited and found.

Presuming the cases upon the frame consist of an "upper and lower," as illustrated in Figs. 4 and 5, page 338, the lower is set on the frame, as shown in Fig. 1, page 56, and the upper above it in like manner as depicted. Our attention must now be concentrated on the arrangement of letters, or, technically speaking, the "lay of the case." Take our word for it, and conclude that the arrangement shown in Figs. 18 and 19, are the best that could be devised; they have stood the test of many years, and are practically the same as in the days of Caxton. "Johnson," in his "Typographia," published in 1824, shows a slight deviation, as also an arrangement introduced by "Lord Stanhope;" but although Johnson claims his "lay" had been widely adopted in London and other places, experience has proven it to be in no way better, and the writer is not aware that any section of the printing

community are now using it; at any rate, the scheme shown in Figs. 18 and 19 is the usual and almost universal arrangement for all European languages, and our amateur must turn steadily down upon the task of acquiring a habit of instinctively reaching his hand to the boxes as he mentally spells out the letters forming the words and sentences of work under composition. This will not be achieved the first day he tries, but our readers must not conclude from this that the habit is difficult to gain, neither is it one which requires any great mental effort; on the contrary, it is so excessively simple, that after a few hours' practice, one's hand instinctively goes to the right box without any mental effort whatever. A day's close application to the work and then throwing it down for a week or fortnight together, will certainly make it always more or less difficult, but only half-an-hour's practice each day, and in an incredibly short time composing type will be as easy as reading or writing to the ordinary scholar.

The drill-master's code of regulations are of most use here—simple movements constantly repeated till perfection is gained. We will allow you a little aid to begin with if you please; but like corks to the young swimmer, these aids must be thrown away as soon as possible. You may now set up the plan of the cases, Figs. 18 and 19, on the top of the cases, in the place usually assigned to "copy." Comparing the spaces on the diagrams with those in the cases, you will readily recognize the space assigned to each letter by its size and position. The capitals in the upper case, it will be observed, run continuously from left to right across the horizontal rows of boxes, each particular box being filled with the type or letter indicated on the plan. The figures likewise follow in due order, but the arrangements of points and special marks are varied to suit the character of the work in hand. The lower case at first sight appears to be subject to no order whatever, but on closer examination it will be found that those letters which are most frequently required, not only have larger spaces allotted to them, but are arranged near together, so that the hand has to travel to the edges and corners of the case very seldom indeed. Look a moment at the word "t h e," as it lies in the boxes of the case. The hand starts at the bottom, runs one box up and to the right, then one box above that, and down under the "h" for a space; then "t h i," cornerwise across each box; and, lastly, after "i," one box to the right is "s," down again to the oft-used space box. You will soon find all the most-used letters lie quite closely together in this case, and you will forget all about thinking where to look for the letters in your anxiety to pick up the greatest number in a given time, hints as to which will be given in due course. If any reader is timid as to the understanding of the positions of the letters even with the aid of the diagrams here given, he may mark the bottom of each box in pencil on the edge of the partitions, but don't trust to these aids instead of the half-hour per day with the drill-master. The cases being in place, the learner is in a position to commence laying his case.

We must now give practical directions for unpacking the type, and getting the letters into the boxes. So long as our packets of letters are safely tied round with string and paper, no more care need be taken with them than with an ordinary parcel, but the moment paper and string is removed, the hitherto strong and compact square mass of metal resolves itself into an assemblage of tiny pieces of metal, which by the slightest awkward handling will be tumbled into such confusion, that the poor amateur, if not of a brave and patient disposition, is apt to turn aside in hopelessness of ever being able to get the mixture of letters sorted out again. This mixture of letters, whether by accident or design, is technically termed "pie," and special provisions have to be made in the case of newspapers and similar concerns, against the awkward results of pieing a forme just as it was going to press. A London cabby was one day hailed by a friend of the writer's, who was deputed to carry a forme of types (upon which much depended) to a printing-office some distance away. The forme was heavy, and cabby was cross in having to lend a hand to get it in. Ill-humour vented itself against the horse, who, urged by the whip of the irate cabby, jerked the cab along over the rough stones in a way which demanded exertion on the part of my friend to keep the forme of type in a tolerably steady position; turning a corner sharply the wheel caught the kerb, and with a heavy jerk the cab stopped dead, the bottom of the cab, my friend, and the forme all "pied" together in the street. Cabby's pent-up wrath burst forth with "There! that's just what I expected would happen to you and your durned old nails; you may just go and pick 'em up again."

Pick 'em up again, indeed! Little thought had cabby how many men and how many hours had been expended in putting together that same frame full of "nails," and the only thing to be done was to send for the "copy," call in comps from every office near, to work away at setting it up from case over again. To avoid such a catastrophe, be it small or great, shall be our next care; so cut the string or carefully untie it, and unfold the paper steadily, leaving the type's face, or letters, upwards, on the flat surface of a table or imposing surface. A galley (Fig. 11) should now be laid on the table, and the type and paper on which it lays pushed on to it; or, what is the same thing, the galley may be pushed under the type, hold-

ing the type steady with one hand, and putting the galley under it with the other. The type must now be steadily held in the galley with the left hand and the paper drawn from under it with the other. The fount of type will now be unpacked, and nothing holds it together but two folds of thin string, or page cord, passed around it; before removing this cord, thoroughly saturate the type with soap and water, applied by dabbing it with a saturated sponge, or the sponge may be squeezed over the type, allowing the moisture to trickle down upon it. This soap and water prevents the types adhering to each other when in the boxes, and its present use is to cause the adhesion of the types by the capillary attraction of the moisture between the surfaces, and thus to lessen the danger of pieing the type during the operation of putting it in the boxes. Now slide the type into the angle of the galley, and setting it up so that the type inclines toward the wood edges, cut or remove the string.

A	B	C	D	E	F	G	A	B	C	D	E	F	G
H	I	K	L	M	N	O	H	I	K	L	M	N	O
P	Q	R	S	T	V	W	P	Q	R	S	T	V	W
X	Y	Z	Æ	Œ	J	U	X	Y	Z	Æ	Œ	J	U
1	2	3	4	5	6	7	à	è	ì	ò	ù	ä	ö
8	9	0	£	½	¼	¾	á	é	í	ó	ú	ë	ü
§	‖	¶	‡	†	*	k	â	ê	î	ô	û	ï	ç

FIG. 18.—THE "UPPER CASE" AND ITS CONTENTS.

The letters will be found in regular rows of sorts A to Z, figures, etc. To pick up the letters it is usual to employ a piece of brass rule, or a setting rule, as Fig. 13. This rule is gently pushed down between the first and second row of letters, the fingers held at each end of the row and pressing the letters together sideways; the rule, with the letters upon it, is then brought into a horizontal position. Suppose part of the row laying on the rule are A's, the rest B's, lay the end of the rule on the edge of the "A" box, and push all the A's off into it, transfer the rule to the B box and do likewise. Repeat this round of operation till all the letters are safely stowed away in their respective boxes.

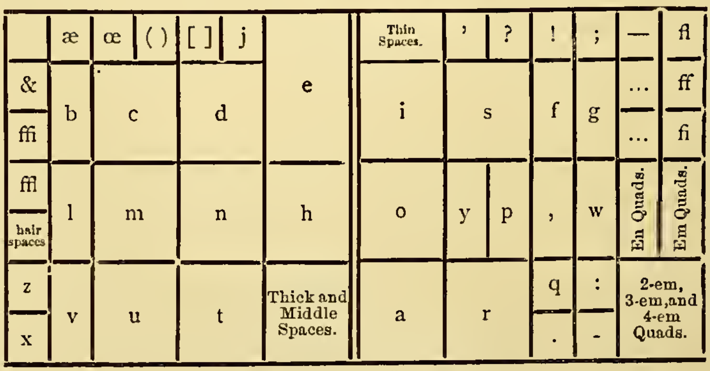


FIG. 19.—THE "LOWER CASE" AND ITS CONTENTS.

If you have a full-sized pair of cases, about 50 pounds of type will leave the boxes properly supplied, and as full as can be worked at comfortably.

The remaining founts of type will now be dealt with in like manner. Before starting actual work, such as a card or circular, it will be well for you to set up a word or two of each kind of letter comprised in your office. Let it be the same set of words in each case, beginning with the smallest type and running up to the largest. Number each line from 1 upwards. Set all the lines in a galley, and pull a proof or two for future use. Cut one sheet up into slips, and fix on the front of each case, to exhibit the kind of type or types contained therein. Mount one or two others on cardboard, and hang up in convenient positions for reference. Your cardboard "List of Founts in Office" will have somewhat this appearance :—

1. A place for everything, and everything in its (Brevier)
2. A place for everything, and (Long Primer)
3. A place for everything, and (Pica)
4. A PLACE FOR (Double Pica) or
5. A PLACE (Double Pica)

The use of this will be at once apparent in indicating the place where any particular "face" or "body" may be found; but it also serves to show, by comparison with other "faces," how much space a line of words which you find too long or too short for a given line, will be occupied by the same words set in another "body" or "face." Thus, if at the bottom of a card you required a line of a given length only, the word could not be shortened to suit the space; but the shape of the letters could be modified, and still preserve the balance—thus, if the word London was required, No. 5 would suit; while, if in

the same space Wolverhampton was required, No. 4 would take its place. Both are of the same height or breadth of body, *i.e.*, Double Pica, but one is "condensed," the other "expanded." Variety of *appearance* is also produced by spacing between the letters, as shown below, the first line being set without any spaces between the letters, the second with "thin" spaces between each letter, and en quads between the words—

PRINTING FOR AMATEURS.

P R I N T I N G FOR A M A T E U R S.

For the moment, however, we are not concerned about producing "variety" or "effect," we have simply to set up a straight line of "copy," "A place for everything, and everything in its proper place." We now take up the composing stick, Fig. 10, page 339, and first of all determine the "measure" or width of the longest line we wish to produce in our printed "List." In this case, we know that we are intending to set a line of each type in the office for comparison, and therefore we take the smallest type and commence placing the type, letter by letter, in the stick. We shall require a rotation No. for the commencement of each line, and the name of body at the end. When this is set and properly spaced out, the loose slide of the composing stick is to be fastened securely, and this will constitute the measure of this "job." Each line is then to be set as far as it will go till the last letter placed in the stick is vertically under the letter e of the word "place" in the first line, then add the name of body and space out or justify to the measure.

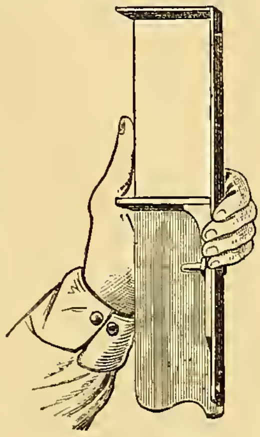


FIG. 20.—METHOD OF HOLDING STICK.

Before the above details be carried out, you will require a little instruction in holding the stick, and manipulating the types while in process of being formed into a line. Presuming the stick to be set to the proper width, hold it as shown in illustration, Fig. 20, with the four fingers of the left hand under the back, and the ball of the thumb pressing the upper edge of the open side. The thumb itself is free to rest on the edge, as shown, or it can descend into the extreme corner, just above the fore-finger. Now stand before your pair of cases in the attitude shown in Fig. 1, page 56, the stick being held at such an angle that any type dropped into it will fall toward the face of the loose slide and the back of the stick.

The letter A being required, your mind instantly dictates to your right hand a journey to the extreme left-hand top corner of the upper case. Let your eye fix on a letter that lays in such a position that when grasped in the thumb and forefinger the head or face will be presented to the inside of the hand; if the nicks are downwards when you pick it up, turn it round by a twirl of the fingers as the hand is coming back to the stick, drop or slide it into the left hand corner of the stick, with the nicks looking upward toward the ball of the left hand, or the open side of the instrument; immediately bring down the thumb upon the letter, and with a gentle pressure keep it in position; a space next follows, and is dropped next to it, the thumb raising itself just enough to allow it to pass and then closing on it immediately. As the line grows in length the fingers and thumb creep along the stick till it is grasped above to the closed or fixed end; and here the line is made to justify by the insertion of thick or thin spaces between some words where it would be least noticed. As this is being done, run the eye along the composed line, and if a regular row of nicks appear from end to end of the row of types, the letters will all be the right side up, and if the right boxes have been applied to the line will be correct; this, of course, will not be the case if, in putting the types in the boxes, you supplied a space with wrong sorts, or if in distributing you have carelessly mixed p's and q's. Don't think the time is wasted which will be bestowed in these apparently trifling matters, for attention to them, and thus acquiring the right method from the first, will make all the difference between success and failure. Drill yourself to each little movement here described, practise it slowly at first, but aim never to miss picking up a letter which lies right side up; never fumble and twist it about on the edge of the case, or turn it up to see what letter is on its face; and if you miss bringing

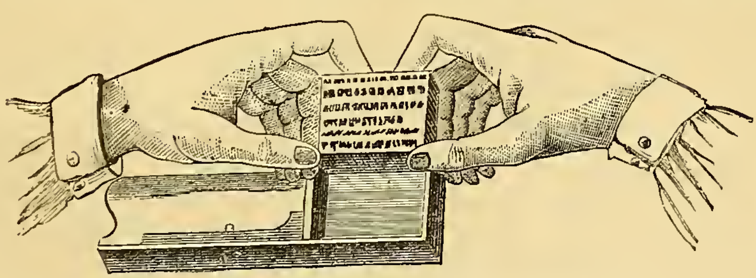


FIG. 21.—TRANSFER OF TYPE FROM STICK TO GALLEY.

it with a gentle click to the bottom of the stick right way up and under your thumb, try carefully the next time, and never rest satisfied till you can set this first line straight off without a hitch or blunder; if it takes you a week of two hours each day, accomplish it before attempting anything else, and you have broken the neck of your difficulties, and though perhaps there may be more "drilling" before you, you have brought your impatience into subjection to thoroughness, and are on the high road to success as a true amateur, who for very love of his self-imposed task, pursues it without hope of any reward, other than in excelling in that to which he has set his hand.

This first line being composed or set, we must now introduce the setting rule (Fig. 13). This must be of the same length as the width of the stick or measure, and in reality is always put in the stick, even before setting the first line: its use is to form a smooth surface for the types to slide down into their place, as the nicks of the line last set up would tend to catch and hinder the proper falling of the letters into their places. The ear or beak projects over the end of the stick, and by this it is removed from behind the last line and placed in front of it, a slight pressure of the thumb all along it will press up the lines already in the stick close together, and the fresh line may be proceeded with in the way we have described, till the stick is full to the top edge.

Now comes our next "drill," which is called emptying the stick, and consists of practice in the method employed by printers in transferring the successive stickfuls of type to the galley (Fig. 11) whereon the composed matter is collected in readiness to be locked up into a forme. The operation is extremely simple when you know how, and one much regrets the impossibility of practical demonstration, which conveys the exact impression desired, without the chance of failure through the imperfections of a mere verbal description; but with the aid of the engraver we hope to make the matter clear. Fig. 21 represents the position of the hands at the moment of releasing the stickful of type immediately before transferring it to the galley.

The galley itself should be near the operator, and placed in a sloping position, so that, like the matter in the stick, it tends to fall into the angles formed by its sides. Now place a rule at the back of the type, leaving the setting rule in the front. Place the thumbs and forefingers as shown, so that they can compress the mass of letters back and front. The second fingers of each hand lie along the entire sides, and can also compress the type in that direction, so that it is evident, if all the lines are equally spaced in the stick, pressure in all direction tending to the centre of the mass will render the loose types practically solid for the time being, and in this condition they might be carried about any distance and in any position. As, however, the human muscles are not without nervous sensibility, we do not advise a beginner to attempt such a test of his powers, but would ask him to content himself with first of all bringing the pressure to bear on the type as described, then slightly lift the type vertically about $\frac{1}{8}$ of an inch. If any letters are loose through bad justification, they will drop down to the bottom of the stick, and show on the face of the mass a missing letter; in this case lower all back again, and tighten all loose lines by spaces as described. If on your next trial all seems tight, you may lower again and consider the next step. While the type is held horizontally, considered as a mass, the letters are all vertical, and the slightest tremulousness of the grasp would allow some of them to drop straight out of the stickful,—the convulsive attempt to stop the rest by a tighter grasp would only precipitate the disaster, and produce a smaller edition of "Cabby and the Nails." So that your aim must be to turn the position of the individual types now standing vertically on the bottom of the stick, to a horizontal one as quickly as possible.

To do this you lift gently and vertically for about $\frac{1}{8}$ of an inch as before, at the same time bringing the mass away from the back of the stick. As soon as your fingers are clear, steadily and firmly, and without hesitation, turn thumbs up and forefingers down, when at once the types will be laying on their sides, the rule on the forefingers supporting the weight, the rule under the thumbs steadying them in position. Now you might walk about across the room to the galley without much fear—for none would now fall out unless the position was brought nearly vertical; but we have assumed the galley is near the stick, indeed just by its side; bring now, then, your hands over the tray, and, lowering your forefingers till they touch the bottom, compress all together again steadily, turn thumbs down gently till feet of type under forefingers touch the galley, and then turn quickly down the whole mass upon the bottom. Without altering the position of the fingers, slide the stickful of type toward the angle of the galley, where it may now be left to repose till joined by similar contributions from the stick, which is continually kept employed till the entire copy in hand has been used up.

If our readers make themselves perfect in the details I have been describing at length above, they will then be in a position to consider the question of tying-up, locking-up the forme, and correcting and imposing, which important parts of the compositor's work must be left to form the subject of the next article.

(*To be continued.*)

A NEW ELECTRIC LIGHT BATTERY.

By GEORGE EDWINSON.

IN concluding my first article on "The Domestic Electric Light," in p. 357, Vol. I., I mentioned the probability of several new forms of batteries appearing during the present season, together with new and cheap lamps adapted to the wants of the amateur experimentalist. At the time of writing this (July, 1883) there has been little progress in this direction, partly owing, I believe, if not mainly so, to the action taken by electric lighting companies under the new Act of Parliament, which allows them to compete with gas companies in catering to supply the public with artificial light. In towns and cities throughout the United Kingdom the light of the future is in a state of uncertain transition, and persons residing in towns are waiting to see what may happen next. Some predict the extinction of gas lamps after the electric light has shone upon them, whilst others believe in the statement that electricity will be vended to users at a cheap rate from wires laid on to their dwellings, or from storage cells delivered at their doors. When that happy time arrives (and interested shareholders say that it is in the near future, perhaps next year), our rooms will be lit with the electric light, our sewing machines and other domestic machinery be driven by motors actuated by the electric current, and batteries for the generation of electricity will be consigned to that museum of curiosities, the lumber-room. Doubtless there is much truth in those predictions and speculations; but it is, to say the least of it, highly tinted truth. But whilst persons believe it, they are not likely to invest money in lamps and batteries, when, by waiting for a few months longer, they may get something superior brought to their doors.

It is true that electric lighting companies are springing up on every hand, as mushrooms spring up on a warm September night, but many of those companies will have only a mushroom existence, and those who remain will meet with strong opposition from interested gas companies and from municipal authorities. Eventually, many of us will be able to enjoy the luxuries attending on a powerful electric current ready to hand, but many more will have to content themselves with the old order of things, or generate the electricity for themselves.

In my last article on this subject, in p. 464, Vol. I., I held out the hope of being able to describe a new and efficient dynamo-electric machine in my next article. Since that time I have reconsidered this half-promise, and have decided to further postpone its fulfilment, for the following reasons. Although professedly a hand dynamo, or such a small dynamo machine as could be worked by a man, there are few persons who would care to work it when it is giving enough current to supply three or four small lamps, and there are few who could afford to erect a gas or steam engine to drive the machine. If, however, enough of my readers express a wish to have it described and illustrated, I will endeavour to oblige them.

In former articles I pointed out the inconvenience of maintaining an efficient current for electric lamps from voltaic batteries, because there was no generator suitable to the purpose excepting those noisome nitric acid batteries invented by Professors Grove and Bunsen. This warning has not deterred some of my readers from using the Bunsen battery, and one in particular has found much amusement and instruction in electric lights maintained by a Bunsen battery. I also mentioned some forms of batteries in which bichromate of potash was used instead of nitric acid, but nearly all such batteries are open to the objection of inconstancy, unless the bichromate solution is kept in a continual state of agitation, and this necessitates a form of cell too troublesome and expensive to the amateur. At that time I heard of a new battery brought out by Mr. Dale, of 4, *Little Britain*, *London*, *E.C.*, and I supposed it to be one identical with a battery of my own invention, but I had not then the opportunity of investigating its identity. Since then, however, Mr. Dale has been kind enough to give me the opportunity, and I have much pleasure in laying the result before my readers.

Dale's Patent Granule Battery.—It is well known that the inconstancy of bichromate of potash batteries is caused by a film of hydrogen being deposited on the carbon plates, and thus causing a condition of things in the cell which is described by the term "polarization." Now, if we can get this film off as rapidly as it is formed, or if we can get the carbon to throw it off, we shall secure the cell from being polarized. The first object is attained by heating or agitating the liquid, but Mr. Dale conceived that the second would be best, and could be obtained by exposing a very large surface of carbon to the bichromate of potash solution, and to have that surface broken up into innumerable small points instead of presenting a plane surface to the liquid. This can be secured by packing a quantity of broken carbon around the carbon plate in the outer or larger battery cell.

Whilst he was experimenting in this direction, my brother and myself were endeavouring to attain the same end by immersing a large number of small strips of carbon, instead of one large plate, in the outer

solution, and by this means made a most powerful battery, free from the evil of rapid polarization. We used the solutions prescribed by Mr. Dale for his chloride battery, a battery made up for the purpose of supplying a current to electric bells doing heavy work. We experienced some little difficulty with the zinc bolts used in this form of battery, and decided to abandon them in favour of zinc cylinders, made to order by Mr. Dale; this gentleman also adopted cylinders of zinc instead of zinc rods. Our form of battery, therefore, differs from his only in one or two particulars, which can be readily observed by my readers.

FIG. 1.—DALE'S PATENT GRANULE BATTERY.

Section of cell showing internal arrangement. C, carbon; Z, zinc.

Dale's Patent "Granule" Battery is made up as follows :—An outer stoneware battery cell of any convenient size to suit the requirements of the work in hand; a cell of porous earthenware to go inside the above-mentioned cell; a cylinder of zinc to go into the porous cell; and a strip of carbon to go into the outer stoneware cell; the whole as shown in sketch. This cell is thus charged:—The porous cell (which should be rather larger in diameter than the usual cells of this class, and made of the best close-grained white ware) must be placed in the centre of the stoneware cell, and packed in this position with a number of fragments of gas carbon, broken to the size of beans; these fragments must also hold a strip of gas carbon, such as the strips used in the Léclanché cells, to form a convenient terminal to the negative element. When the space between the sides of the two cells has been thus filled up with broken carbon, there will still be room for a quantity of liquid between the lumps of carbon, and this space is filled with a mixture of a saturated solution of bichromate of potash, 2 parts, and common muriatic acid, 1 part. The charge for the inner or porous cell, in which the zinc cylinder forms the positive element, is a solution of chloride of zinc in water, in the proportion of solid zinc chloride, $\frac{3}{4}$ oz., to 1 pint of water. The zinc cylinder should be well amalgamated with mercury before being put into the cell, and it will also be advisable to pour from $\frac{1}{2}$ oz. to 1 oz. of mercury (quicksilver) into each cell with the zinc. A saturated solution of bichromate of potash means that this salt must be dissolved in warm water until the water will dissolve no more, this quantity being generally in the proportion of 3 oz. of the salt to 1 pint of water. Care must be taken not to spill the solution on boards, carpet, or clothes, as it will leave an indelible stain; and it should also be known that the salt or its solution is very poisonous.

Bichromate of potash, 1s. to 1s. 2d. per lb.; Chloride of zinc, 1s. 6d. per lb.; Muriatic acid, 4d. per lb.; Mercury, about 3s. 6d. per lb.; Carbon, 6d. per lb.

The prices of Dale's Patent Granule Battery, per cell, complete, are as follows, according to size :—

				s. d.
A.	Square Porcelain Cell,	5 in. by 3 in. by $1\frac{3}{4}$ in.,	each cell,	4 6
B.	,, ,, ,,	6 in. by 4 in. by $2\frac{1}{4}$ in.,	,,	5 6
C.	,, Stoneware ,,	$6\frac{1}{4}$ in. by $4\frac{1}{4}$ in. by $2\frac{1}{4}$ in.,	,,	5 6
D.	,, ,, ,,	7 in. by 5 in. by 3 in.,	,,	6 6
H.	Round ,, ,,	$6\frac{1}{2}$ in. by 5 in. in diameter	,,	5 6
K.	,, ,, ,,	$6\frac{1}{2}$ in. by 5 in. ,,	,,	4 6
L.	,, ,, ,,	8 in. by 5 in. ,,	,,	6 6
M.	,, ,,	10 in. by 6 in. ,,	,,	7 6

The series from A to H are supplied sealed with pitch, to prevent spilling of the liquid whilst being carried, and are used for firing fuses, testing wires, and working medical coils. The series from K to M are left open at the top, and the two latter sizes have an aperture at the bottom to facilitate the drawing-off spent solution when the cells need recharging.

The advantages of this battery over others is as follows :—Compared with the Bunsen cell of equal size, its force (E.M.F.) is only $\frac{4}{100}$ of a volt less. It is free from noisome fumes. When charged and set up, it will remain ready for action at any time within a week. It will work intermittingly or constantly, as may be required: can be worked in spells of three hours each for five or six successive days without attention, or do two or three days' work of seven hours each without requiring to be recharged. Five cells of the L size will keep a five-candle incandescent electric lamp lighted up for three hours each evening throughout one week, or perhaps longer, without requiring to be recharged; and one battery of my own form has been in use for six days at such work as coppering or nickel-plating before it gave signs of failure. In my own form of battery I suspend a number of carbon strips from a cover surrounding the porous cell; this cover is perforated with holes, to

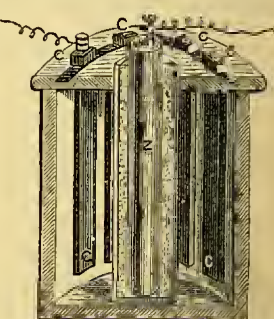


FIG. 2.—IMPROVED BICHROMATE OF POTASH AND CHLORIDE OF ZINC BATTERY.

Section of cell showing internal arrangement; C, C, C, strips of carbon; L, L, strips of lead to maintain contact between carbons; A, cover of wood suspending carbon strips; Z, zinc cylinder.

admit the strips, and these may be of roughly cut carbon; in fact, rough, jagged, angular strips are best for this purpose. Each strip must have a head of lead cast on to it; one of those heads should be fitted with a brass terminal or binding screw, and all the strips must be connected together by a strip or ring of lead. I also make my own chloride of zinc by dissolving scrap zinc in muriatic acid until the acid will dissolve no more, and then diluting the liquid with twice its bulk of rain water. Sal-ammoniac (from two to three ounces) may also be used in the porous cell instead of chloride of zinc.

Before casting the lead heads on the carbons, these must be prepared with hot paraffin wax. Melt the wax well into the head of the carbon strip to the depth of one inch, driving it in with a hot iron. In casting the lead head it will be observed that the hot lead will drive out and burn excess of paraffin, but enough will be left to prevent the bichromate salt from creeping up under the head. If the carbons can be cast in a ring of lead it will be an advantage to do so; the next best method is that of attaching a strip of lead by autogenous soldering; ordinary solder gets "eaten away" in the course of a few months, whilst copper and brass wires soldered to the heads soon disappear.

Mr. Dale will supply suitable cells and parts for them at the undermentioned prices:—Stoneware cells, 10d. each; stoneware cells, L and M size, 2s. and 2s. 9d. Porous cells for the 6 in. high batteries, 6d. each; for the larger sizes, 9d. and 10d. each. Zinc cylinders to fit porous cells, to order, 1s. per lb.; or amalgamated, ready for working, 1s. 3d. per lb. The prices of suitable cylinders are—for K, 1s. 3d.; L, 1s. 9d.; M, 2s. 3d.; these prices include cost of brass terminals to each cylinder. Suitable carbons, with lead cap and terminal—for K, 1s.; L, 1s. 9d.; M, 2s. 8d. Rough thin strips of carbon, without lead heads, 3d. to 4d. each. I may also mention that the maker does not fear any damage to his patent rights from amateurs imitating my form of the battery, and will be most happy to supply them with materials, or advise them in the use thereof.

The lamps most suitable to be worked by the current from this battery are the incandescent lamps of low resistance, giving a light of about 5-candle power each lamp. Mr. Dale sells these from 4s. 6d. each. I have already stated that it will require five cells in series to light up one of those small lamps; but it must be understood that I refer to incandescent lamps of comparatively low resistance, such as the Swan lamps, the Woodhouse and Rawson lamps, or those supplied by Mr. Dale with the battery. Such lamps require a current strength of from 1·3 to 1·5 amperes, with an E.M.F of nine volts, to properly light up the carbon filaments, and this strength can be got from five of the L or M size cells above mentioned. With lamps of a higher resistance, such as those to give a ten-candle light, fully ten of those cells in series will be required, and, as the resistance of lamp, wires, and connections may be even higher than the force of ten cells will overcome, we shall probably require eleven or twelve cells in series to properly light up the carbon filament. If we put on more lamps we must put on more cells in parallel circuit, and must bear in mind that enough cells in series must be employed to get up the proper glow. Even when the lamp is doing its best it may not give the light of its nominal candle power as compared with that of good sperm candles. It will be well to know that incandescent lamps should never be subjected to enough current to give out a light with a pale blue or violet tint, as this indicates destruction of the carbon filament. They are working safely when they give a white glow, slightly tinged with yellow. The "granule" battery is not suitable to the maintenance of arc lights, nor to similar work demanding a large volume of current at high tension.

Before I close this article, I may mention here that my esteemed correspondent, "ELECTRIFIED LAWYER," has favoured me with a sketch of a lamp devised and made by himself. Fig. 3 shows this lamp, which is made of the following homely materials:—A wide-mouthed glass jar or pickle-bottle, into the mouth of which fits a bung or a circular disc of wood. Through this passes a bit of fine platinum wire; this is made into a loop, in imitation of Swan's lamp carbon, and the other end is passed out through the bung or stopper again. Two straps of copper, or stout wires of this metal, are secured to a base board on each side of the jar by a pair of binding screws (telegraph pattern). These straps rise up by the side of the jar, the ends are bent over the top, and tightly clip or grip the two ends of the looped platinum wire. On connecting the wires from a ten-cell Bunsen battery to the binding screws of the lamp, the platinum loop gave out enough light to see to read a book by it comfortably. The ten cells of the battery were made up of gallipots, to save the expense of outer jars.

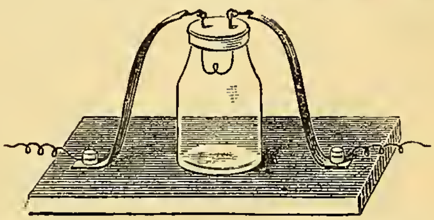


FIG. 3.—AMATEUR INCANDESCENT ELECTRIC LAMP.

The same correspondent has also made a small arc lamp, but it appears that its performance was not so satisfactory as the incandescent lamp above mentioned. Readers who may wish to imitate this lamp

will please understand that a white glass jar should be used, not green glass. Copper strap will be better than copper wire—that is, a strip cut off from some sheet copper. The ends of the platinum wire may be tightly clipped by the turned-down ends of the copper strap pinched closely with a pair of pincers or pliers. To avoid disappointment, get more platinum than will be required for one experiment, for it is just possible that several lengths will be fused-in the course of an evening's amusement.

For information on casting lead heads to strips of carbon, I must refer my readers to p. 415, Vol. I., and for other information on electric lights, and how to make up the batteries, to pp. 357 and 464, Vol. I.

RUSTIC CARPENTRY.

By ARTHUR YORKE.

V.—FENCES, VERANDAHS, AND FURNITURE.

RUSTIC FENCES.—The crooked branches of the oak, elm, etc., are sometimes used for making rustic fences, but they cannot be said to be altogether proper for that purpose. It is almost impossible so to arrange these irregular pieces as to leave no openings through which the smaller live-stock may find a way. For fence-making, more than for any other kind of rustic work, there is no material to be compared with straight larch poles. No other wood lasts so long, looks so well, or makes so complete a safeguard.

A fair height for a fence against cows and horses is 3 feet 9 inches. If sheep and pigs only have to be guarded against, a less height will suffice—say 3 feet. In the three designs given in Figs. 26, 27, and 28, the former standard is followed, the posts rising about 4 feet above the ground. Not less than 2 feet ought to be allowed for the posts below the surface. These posts are supposed to be placed 8 feet apart—a good distance for strength; though fencing posts are often set at longer intervals—9 or 10 feet. The scale on which these sketches are made is $\frac{3}{8}$ of an inch to the foot.

The fence, Fig. 26, is light and simple, has little work or timber in it, and will look well for situations in which it can be used. It will be a safe protection against horses, cows, and grown sheep; but not against young pigs, lambs, or poultry, as the lozenge-shaped openings will be 9 to 10 inches across.

Fig. 27, on the other hand, will give full security. In its lower half, where only danger is to be looked for, there will be no opening more than 3 inches wide; consequently nothing beyond a very small chicken could find its way through.

Fig. 28 would also make a tolerably close fence, and would look well; but, for practical purposes—as regards strength, that is—it would be found inferior to Fig. 27.

Hitherto we have been able to keep clear of mortise joints; and we might continue to do so in the present work, by making crosscuts with the saw on both post and rail, where they meet, chipping off a bit from each, and nailing the two together. But by using the mortise and tenon we shall be able to make a far stronger, neater, and more workmanlike fence. Cutting a mortise in a fencing-post is an extremely simple thing to do. Our posts are, we will say, about five inches in diameter, our rails about three and a half. A couple of holes are bored with a two-inch auger through the middle of the post, as far apart at their outside as the rail is wide, and the neck of wood left between is soon chipped away with a mallet and strong chisel.

Fig. 29 shows a horizontal section of the end of a rail cut to a tenon; and Fig. 30 shows a vertical section of the post through the mortise, and explains the way in which the ends of two rails are shaped to meet and fit together. Nothing can be more firm and compact than these when driven home; and any possibility of movement is prevented by the rails being nailed to the "stuck," which comes half-way between every two posts, and which is pointed, and driven well into the ground, a hole first being made for it with a crowbar.

Rustic Verandahs and Trellis-work.—To give designs for trellis-work and rustic verandahs for cottages had formed a part of my plan for the present articles. But such designs must necessarily have occupied considerable space, and I see with alarm the number to which my drawings are increasing. It also occurs to me that, to be of direct practical value, such designs ought to be fitted to the requirements of the particular spaces in which they would have to be erected. I shall therefore omit them. In the sketches already given of the fronts of summer-houses, of the porch, and of the garden arch, materials will be found which can readily be adapted to these purposes by the ingenious worker.

Most of the remarks on roofing, made with regard to the front, might with equal propriety be applied to the verandah.

There is, however, one little matter, the especial use of which is in the decoration of verandahs, which I must not omit. This is the rustic chain. A rustic chain can be introduced wherever a graceful curved line is wanted, as in making a festoon for light creepers along the top of an opening. It will therefore be of occasional service in other places than verandahs—in summer-houses, in porches, etc. I show such a chain in Fig. 30.

These chains are scarcely known in English rustic work, but they are commonly seen in Holland and Belgium. This is not the first time, nor is this the first publication, in which I have brought them under the notice of my English fellow-workers.

A rustic chain is made by taking pieces of round wood, from 1 to 2 inches in diameter, according to the work, and sawing them to a uniform length—say 4 inches, or rather longer if the sticks are large. These form the straight parts of the chain. The bent parts, which interlock with each other, are made of small rods, say of ½ inch diameter. Willow will do, but hazel is tougher and better. These also should be cut to uniform lengths—say 6 inches each—and split. The manner in which they are bent round the ends of the larger pieces and linked into each other is explained in the illustration. They are fastened with nails. For the larger pieces in this work, lengths of maple or wych elm, covered with their rough and highly ornamental bark, will be found to look best.

Boxes for Flowers.—To contain growing flowers, whether as window boxes or in other situations, no receptacles look better and more appropriate than those made of rustic-work. The drawback to using rustic-work for this purpose is, however, the fact that when so employed it quickly decays. No wood can long stand constant contact with damp earth, and frequent floodings with water. Still, when the effect is so good, and the labour of renewal so small, as in the case of window-boxes, it may be worth while to incur the trouble of making new ones every third or fourth year.

The box itself may be made of any rough board, as roughly nailed together, and the front should be divided into squares, and ornamented with mosaics of small rods, in a geometrical pattern. A split rod nailed round the edge of the box, on its top, will hide the edge of the mosaic to the front, and that of the rough board all round. Holes should be bored through the bottom to let off any superfluous moisture; and if the window-ledge is long, it will be found more convenient to make the box in two or more lengths.

The box, or vase, given at Fig. 31, is of a more ambitious kind. It is supposed to be one of a pair to stand on either side of a rustic porch, or at either hand of the entrance to a summer-house. Such a vase would hold a plant of considerable size, the receptacle for earth being 14 inches square at the top, and as many deep. The total height of this article is 3 feet. The box itself is, of course, made of board. I have used fir cones and mosaic for decorating it; bark might be used instead, but it would need renewing by the end of the second season. This vase might be prettily varied by making the earth-box octagonal.

Rustic Furniture.—Among the minor uses of rustic carpentry is that of making chairs, tables, etc., for the summer-house and lawn; and the superiority of articles thus formed over those made of iron or of wrought wood, is, in point of taste, beyond all question.

In my larger summer-house I indicated a table of considerable size. Such a table would not require to be movable, and this would render its construction a very simple matter. A pillar, or, if its size demanded them, four pillars, might simply be let into the ground, and when the top has been fixed on and covered, nothing more will be wanting.

For the edge of a large table of this kind, the device shown in Fig. 32 is pretty and useful. Falling, as it may be made to do, to a depth of some inches, it will prevent too much of the unornamental pillars being seen.

A really satisfactory covering for the top of a rustic table—one which shall at the same time be in character and keeping with its surroundings, be firm, smooth, and enduring—is a desideratum which has yet to be introduced. Bare board is and must be unsightly, and any kind of manufactured covering for it would be out of place and in bad taste. For the want of something better we are forced to fall back on our mosaic work; which cannot, from its very nature, present that smoothness so desirable in the top of a table. We have, therefore, to make our mosaic for this purpose as neat and level as possible. We must use only very small rods, keep all the pieces of the same thickness, and carefully trim off every knot. For such work, peeled withy rods are very suitable, among which some smooth hazel sticks may be introduced for variety of colour.

In Fig. 33 we have a small movable table for use in a small summer-house, or on a lawn. Its top is 18 inches square, and its height 26 inches. To secure firm standing, it will be well to choose the cross pieces which form the bottom a little curved, and to place them, like those in the cut, with the curves upwards. The construction of this table is sufficiently easy. The two cross-pieces are cut half through, and fitted together at their intersection; and they and the upright are fastened together by a strong spike-nail. The sloping pieces, which are nailed on afterwards, and which serve as braces, prevent any danger of movement in the joint. The top is of 1 inch or ¾ inch elm board. I have supposed the upright in this case to be a piece of straight larch.

The rustic chair, Fig. 34, is, with the exception of the actual seat, wholly made of oak bangles. Larch, and other straight fir woods, so admirable for most rustic purposes, do not as a rule lend themselves well to chair-making. So used they are apt to look too stiff and formal. Oak bangles, on the other hand,

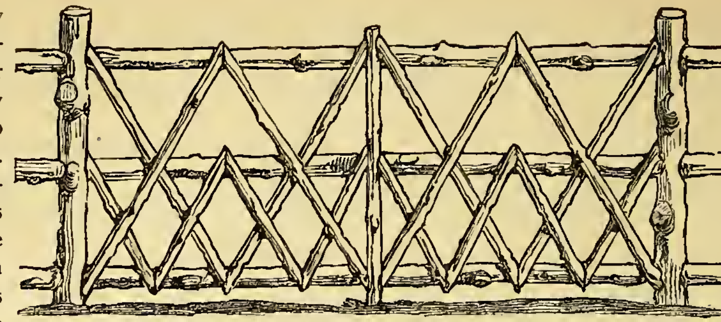


FIG. 26.—RUSTIC FENCE. FIRST EXAMPLE.

seem admirably fitted for this particular work. Their crookedness may now be turned to good account. From among a number of oak bangles there will rarely be much difficulty in selecting pieces with the double curve, which fits them for forming the main framework of the chair; nor in finding a branch with the bold single curve required for the back. The other pieces are such as will come to hand almost without choosing. In fitting these rough pieces of oak together neatly and firmly, some little dexterous use of the saw will be needed. The seat, which requires more smoothness than could well be got from oak, should be made of hazel or withy rods.

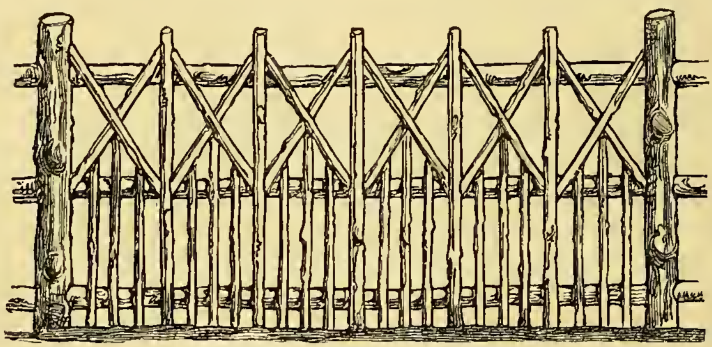


FIG. 27.—RUSTIC FENCE. SECOND EXAMPLE.

Such a chair will be found compact and comfortable, and can easily be carried from one part of a garden to another as required. It can be placed under shelter when not in use; a point worth consideration, as work made of oak bangles does not last well when exposed to the weather.

In the long garden seat, Fig. 36, I have also used oak for the supports; the other parts may be made of straighter wood, such as strong hazel sticks, or small elm saplings, for the larger pieces, and smaller hazel rods for all the remaining work. As this article will generally have to stand out of doors, it will be well to leave spaces between the strips which form the seat, that the rain may pass freely through.

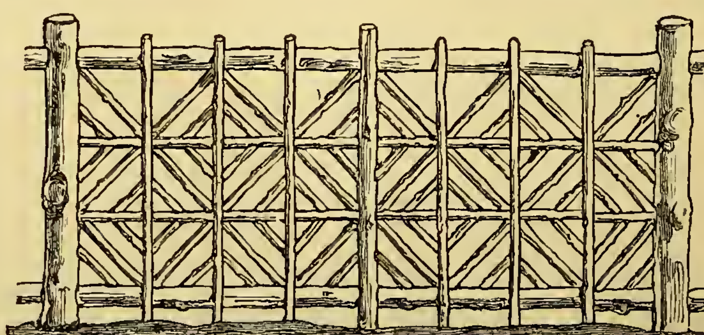


FIG. 28.—RUSTIC FENCE. THIRD EXAMPLE.

It will be understood that in taking any steps to preserve articles of any kind in rustic carpentry from the action of the weather, the application of paint is altogether inadmissible. The very nature of the material that is used, much, if not most of it, being far harder and therefore more impenetrable to wet than deal and other woods that can be easily worked, renders the use of a protecting coating unnecessary, and where any is used at all it should be in the form of varnish only, or of a couple of coats of boiled oil which will soak into the pores of the wood and thus render it less liable to be affected by moisture. To paint rustic work would go far to deprive it of its *rusticity* and simplicity, which are its chief charms. For wood of any kind that has been worked with the plain paint is all very well, but even for this, whether it be in-doors or out-of-doors, I am inclined to think that staining, if absolutely necessary, followed by sizing and varnishing, is preferable to any other kind of external coating.

With these remarks, I must bring my articles on Rustic Carpentry to a close. Examples might, of course, be multiplied to an unlimited extent, but I do not see that any really useful purpose is to be attained by adding to those already given. For the many other objects to which rustic-work can be applied, the ingenious amateur can, with the help of the sketches and suggestions given, have little difficulty in forming designs of his own. In doing this, as well as in working out the plans which I have drawn, I wish every success to all who attempt to follow them.

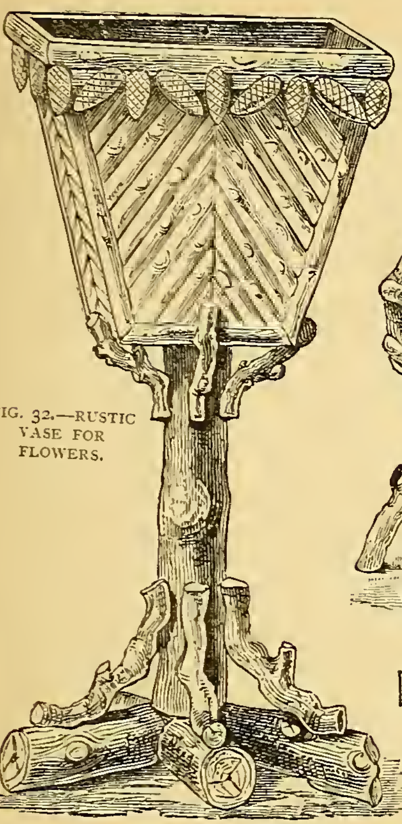


FIG. 32.—RUSTIC VASE FOR FLOWERS.

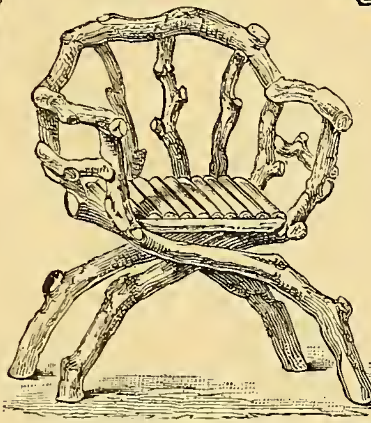


FIG. 35.—RUSTIC CHAIR.

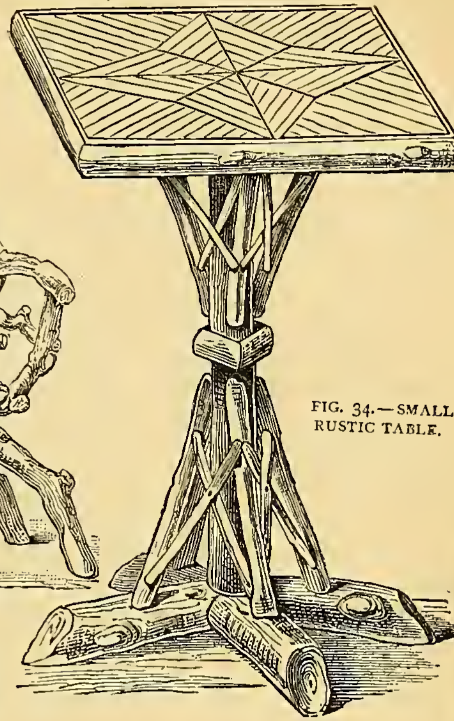


FIG. 34.—SMALL RUSTIC TABLE.

FIG. 29.—HORIZONTAL SECTION OF END OF RAIL CUT TO TENON.

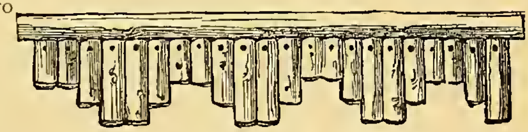


FIG. 35.—EDGE OF TABLE.

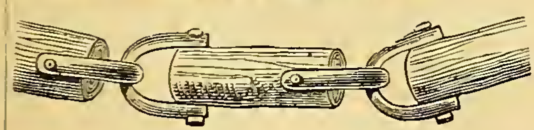
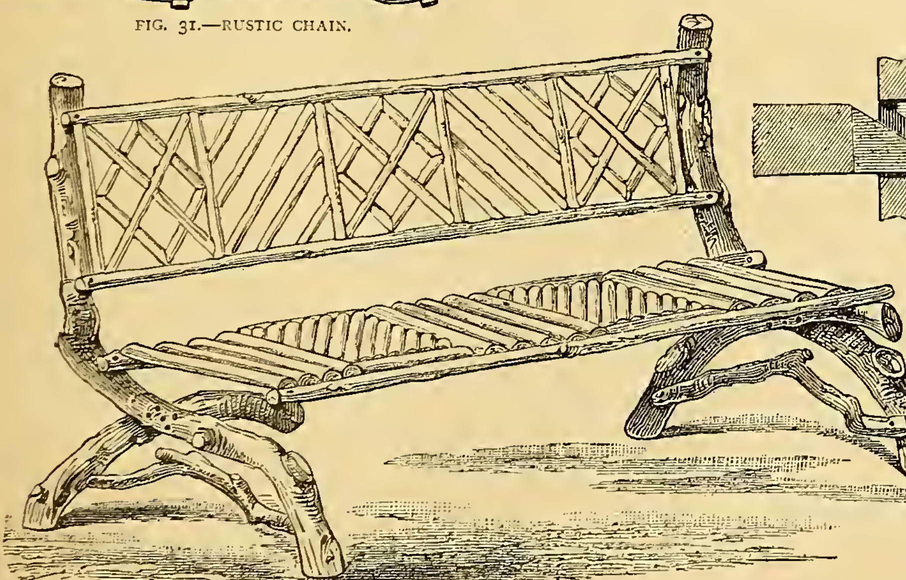


FIG. 31.—RUSTIC CHAIN.



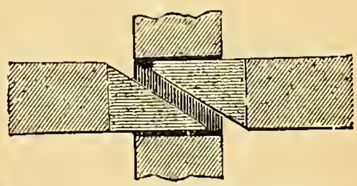


FIG. 30. — VERTICAL SECTION OF POST THROUGH THE MORTISE.

FIG. 36.—GARDEN SEAT.

HOW TO UTILIZE THE TABLE OF AN OLD TREADLE SEWING MACHINE.

By OLLA PODRIDA.

(*For Illustrations, see Supplement to this Part.*)

SOME years ago, whilst labouring under a severe attack of "model mania," I constructed a small bench lathe, of $1\frac{1}{2}$-inch centres, and 14-inch bed, with the intention of fitting it on the table of a sewing machine. I failed to obtain one at the time, and wishing to use the lathe on some small work, I rigged up a wooden stand, and had a fly-wheel moulded and cast off that of a friend's machine. I worked it by foot with success, although my treadle was much inferior to the regulation pattern, and the stand was not as rigid as that of a sewing machine. Since then, I have often thought that a superannuated treadle machine might be regenerated in various ways, and a new lease taken on its valuable existence.

The class of machine which I consider to be most suitable for conversion is the old "Howe" pattern, it being very rigid in construction, and possessing a substantial fly-wheel, with a heavy rim about 2 inches larger than the grooved speed, the latter being about 13 inches in diameter. To this, as already implied, a lathe may readily be adapted, but it must necessarily be low—at any rate, of not more than 2-inch centres, the driving power being deficient. This size, although affording ample scope for light fancy turning, would be rather small for a beginner, as he would soon be apt to outgrow its limits. However, should a lathe be adapted, the arrangement for driving should be the same as shown in Fig. 1 for circular saw, in order that the speed may be varied to suit the work; the fly-wheel having but one grooved speed renders variation impracticable, unless some intermediate arrange- is employed.

Those who possess a moderately sized lathe can dispense with a small one of this class, unless they have a laudable desire to exercise their skill and ingenuity in manufacturing one. On the other hand, those who do not possess lathes, or the use and skill in using one, cannot very well make one. It is much better to buy; and here let me add that if anyone is going in for one, and is governed by the size of his purse, and that size is not more than 2 or $2\frac{1}{2}$-inch centres, I most strongly advise him to wait a bit till it can swing $3\frac{1}{2}$ or 4 inches clear of the bed. After that, his aspirations can be supported on wooden blocks under the headstock and poppit.

The best general use that could be made of an old machine stand would be to fit it with a small circular saw, interchangeable with a suitable emery wheel or buff, and gear for drilling small holes. This adaptation I intend describing in detail, and hope that those of our friends who may feel disposed to take the matter in hand may find as little difficulty as possible. We shall require a few castings, the patterns for which shall be as simple as practicable in form and construction. Some of these castings may be made at home, or they may be entirely dispensed with, and hard wood supports substituted; these would do very well for sawing and grinding work, but would be unsuitable for drilling purposes.

We must first obtain a complete idea of what we are about to tackle. This will be seen in Fig. 1, an end elevation, and Fig. 2, a plan, both showing the general arrangement, with saw in place. The saw bench is omitted for the sake of clearness. The Howe tables are about 27 inches long by 15 broad, so that there is plenty of room on the board. We shall require two supports or bearings for the intermediate pulley spindle at A, and two for the saw spindle. Three of these bearings are alike of the form given in Fig. 3, the three parts of which show the elevation, side elevation, and plan respectively. The fourth support, being the one for back end of saw spindle, has provision for a set-screw or back centre at the top instead of a bearing. This, with the set-screw in place, is shown in Fig. 4, in front elevation, side elevation, and plan.

If it is intended to use the circular saw or emery wheel only, and to dispense with the drilling apparatus, these bearings may be cast in pewter, similar to Fig. 3. In that case, Fig. 4 may be dispensed with. In any case, pewter may be used for the intermediate bearings; it may also be used for bearing carrying head of saw spindle, but being too weak to resist the thrust in drilling, the support for back centre should be made of brass. The pewter castings could be made at home in moulds of sand. A little zinc should be added to it to make it harder, and it could be melted in a ladle on the kitchen fire.

Before going further, we will suppose these castings to have been obtained, and describe their preparation for the spindles. Take Fig. 3 first, and file them true on the bottom or base, keeping them square with each other, then bring them to the same height exactly, and fit the caps or upper parts of the bearings, drilling two holes in each for $\frac{1}{8}$-inch screws, as shown. Having done this, screw the caps firmly in their places, and carefully drill the holes for bearings, keeping them central on the line of contact. Take pains to ensure good holes, and to keep each true and square with its base. Also drill and countersink for woodscrews four holes in each foot, as shown, for fastening down, and oil-holes, about $\frac{1}{16}$ inch diameter, in caps.

The bearings finished, we next turn our attention

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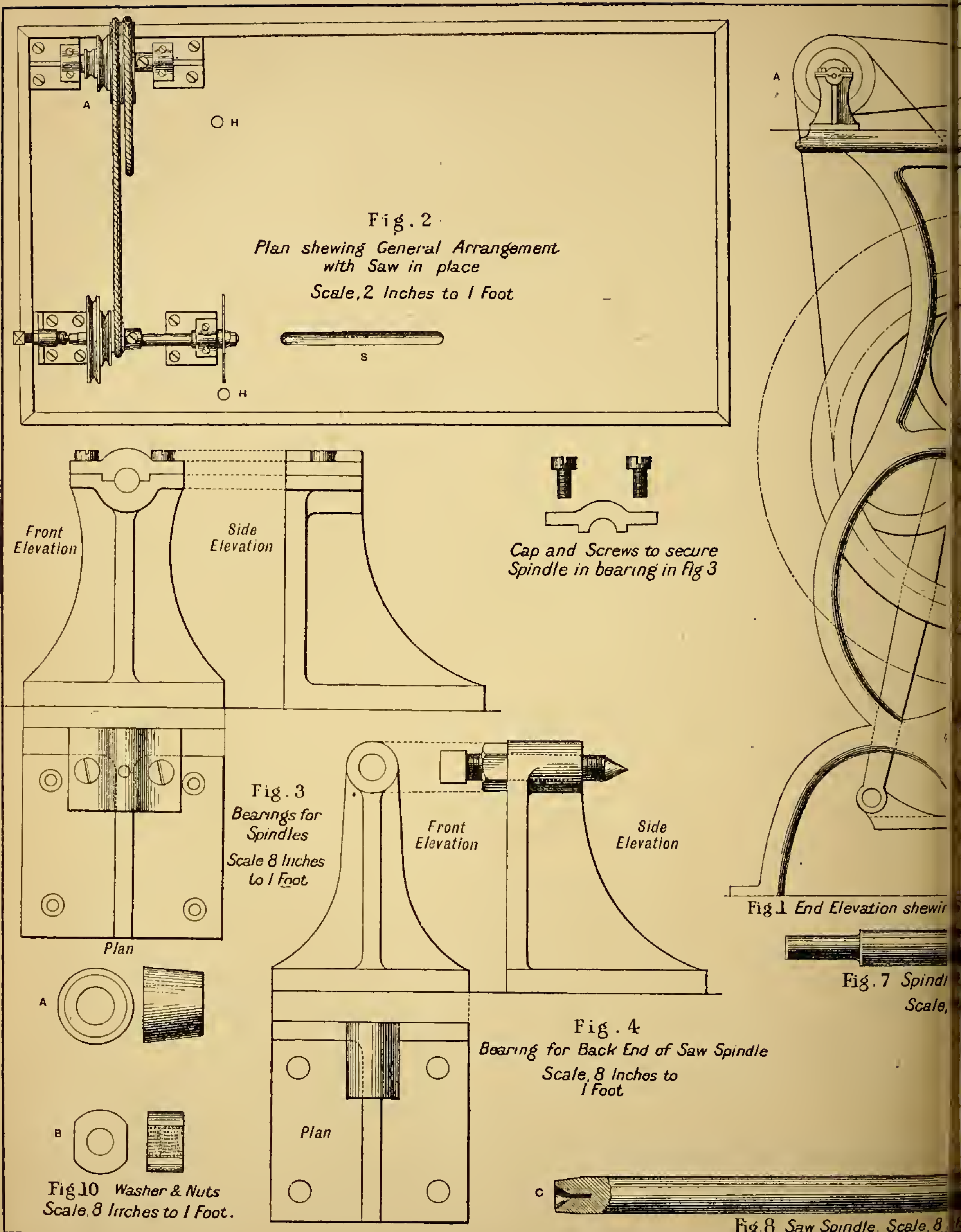


DESIGN AND WORKING DRAWINGS, SHOWING HOW TO

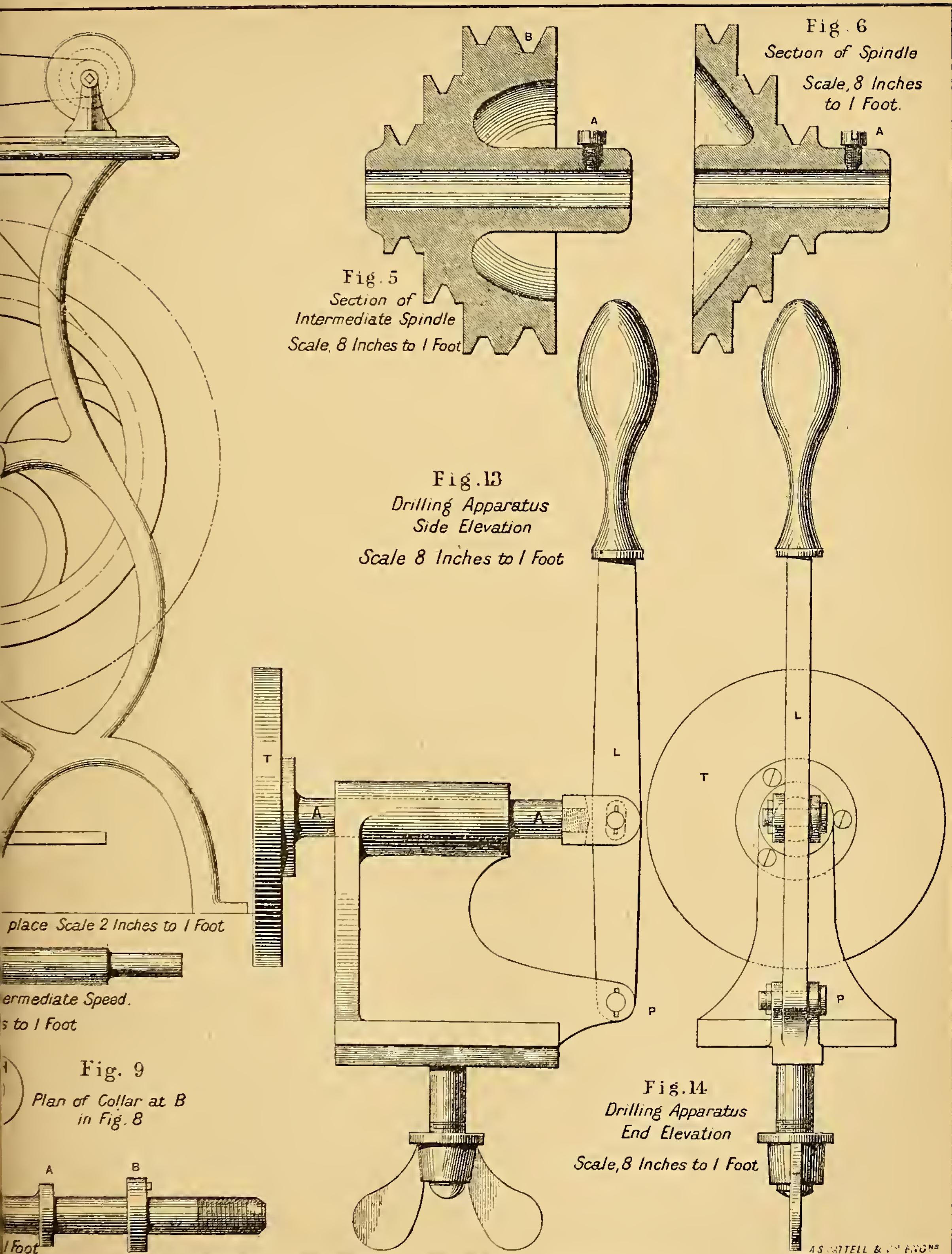


Fig. 5
Section of Intermediate Spindle
Scale, 8 Inches to 1 Foot

Fig. 6
Section of Spindle
Scale, 8 Inches to 1 Foot.

Fig. 13
Drilling Apparatus
Side Elevation
Scale 8 Inches to 1 Foot

Fig. 14
Drilling Apparatus
End Elevation
Scale, 8 Inches to 1 Foot

place Scale 2 Inches to 1 Foot

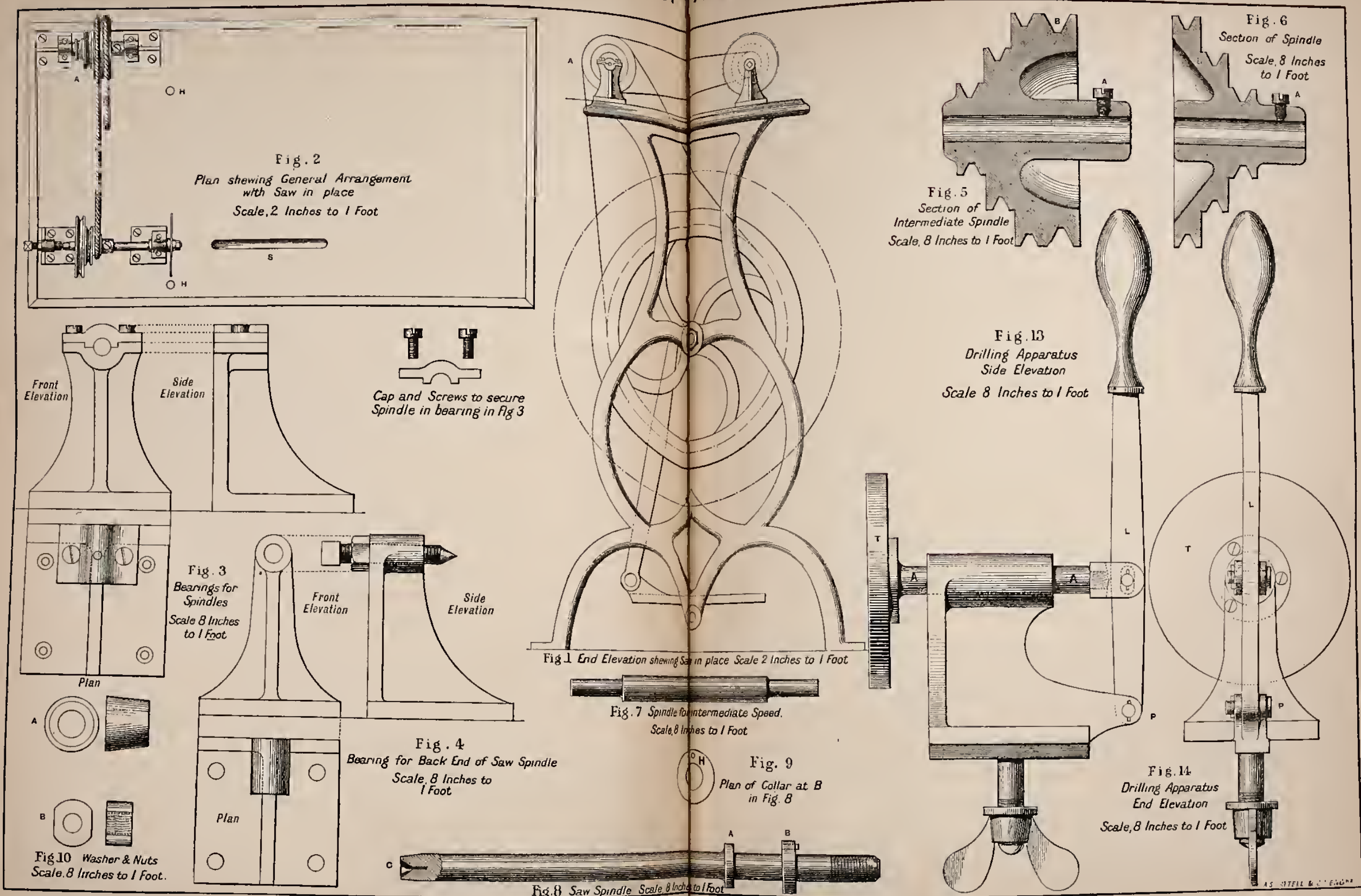
ermediate Speed.
s to 1 Foot

Fig. 9
Plan of Collar at B in Fig. 8

1 Foot

E THE TABLE OF AN OLD TREADLE SEWING MACHINE.

PRESENTED WITH PART XXII. OF "AMATEUR WORK, ILLUSTRATED."



DESIGN AND WORKING DRAWINGS, SHOWING HOW TO UTILISE THE TABLE OF AN OLD TREADLE SEWING MACHINE.

to the pulleys. These may be made of hard wood; in that case, the spindles should be square to receive them, and the blanks should be driven on tightly, and turned up in their respective places to ensure truth. If cast of pewter or brass, they must be a good fit on the turned spindles, and secured by $\frac{3}{16}$-inch setscrews, as shown at A, A, Figs. 5 and 6. Fig. 5 is a section of the intermediate one. The speed marked B belongs to the driving wheel, $3\frac{1}{4}$ inches outside diameter, and grooved to suit a $\frac{5}{16}$ or $\frac{3}{8}$-inch band. The other speeds step from $3\frac{1}{4}$ to $2\frac{1}{2}$ and $1\frac{1}{4}$ inches diameter, and are grooved to suit a $\frac{1}{4}$-inch band. These bands should be of round leather, such as are used for sewing machines, and can be procured of any agent for the same. Instead of the wire hook connection used, I should prefer the ends butted and fastened with waxed shoemaker's thread, a score being cut in the band for the thread to lie in. This will run better over the small speed.

hole drilled to fit on this pin, which is also shown at H in Fig. 9. Two washers and nuts, Fig. 10, must be provided for tightening up the saw. These may be made of brass or iron, as convenient, and must be a good fit—especially the nut—on the end of the spindle, which is turned $\frac{5}{8}$ inch in diameter, with a corresponding thread cut on it as shown. This should be done in a lathe, if possible, as screwing by hand with dies is an uncertain means of obtaining truth. A thinner washer must be used to suit the thickness of emery wheel employed. With the arrangement shown, provision is made for a wheel $\frac{3}{4}$ inch thick. The collars at A and B must fit the ends or sides of bearing in support, which, for this purpose, must be turned up with the file. The set-screw forming the back-centre or tail-pin must be made of steel, not less than $\frac{5}{16}$ inch in diameter, provided with a locknut to keep it from working loose

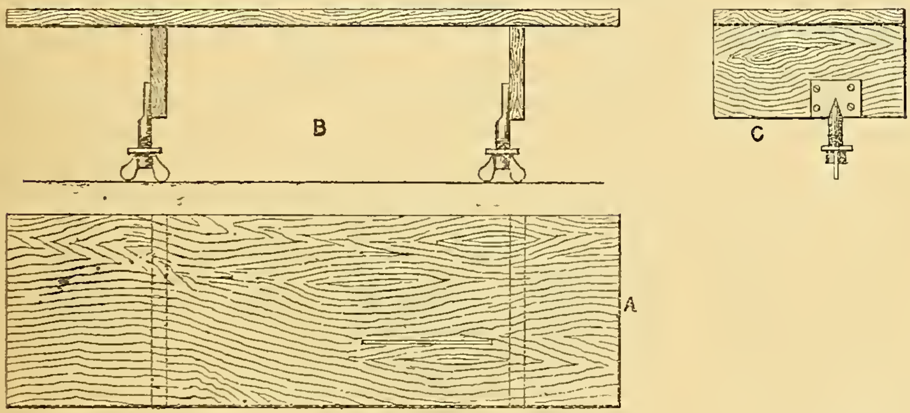


FIG. 11.—PORTABLE SAW BENCH FOR TABLE. A, PLAN; B, FRONT ELEVATION; C, END ELEVATION. Scale, one-sixth full size.

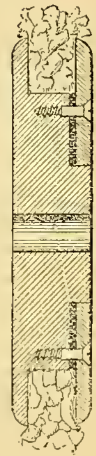


FIG. 12.—SUBSTITUTE FOR EMERY WHEEL. Half size.

We now come to the spindles. The one for intermediate speed is simple in form, as seen by Fig. 7. It is $\frac{3}{8}$ inch in diameter, square or round as may be adopted, and reduced at the ends for bearings $\frac{1}{4}$ inch in diameter. The saw spindle should be of steel, so that the back end may be hardened to resist undue wear on the centre, which should also be of steel. Fig. 8 is a full sized view of this part. The collar at A is to keep the spindle in place; that at B forms a back for the saw, emery wheel, nose chuck for drills, or whatever may be fitted. The female centre at back end, C, should be drilled of a good size, with a small clearance hole up the spindle, as shown in part section; this will serve as a small receptacle for oil, as well as to protect the point of the back centre from damage. A hole, $\frac{3}{32}$ inch in diameter, must be drilled in front of the collar at B, into which a steel pin must be driven tightly. This forms a driver for the saw, which must have a corresponding

and a square head for tightening up, as may be seen at Fig. 4. The point of this, as well as the end of the saw spindle, must be made as hard as possible.

Having gone through the details, we will now make a start on the fixing. This, if proper care has been bestowed on the supports in drilling the bearings, will not involve much trouble, as the top of machine tables are generally pretty level. Let us start with the intermediate spindle. To find the correct position of this, place a straight-edge across the side of the driving wheel underneath, and keeping it there, bring it against the back edge of the table, and mark on the table the *centre* of the groove in the wheel. Repeat this operation for the front edge, and join the two marks by a line right across the table. Now put the spindle and pulley in its bearings, and set the centre of the speed marked B fair with the line on the table. Mark two of the holes in each foot and screw down, carefully lining up the slack places under the feet with

paper, until, when screwed down tightly, the pulley spindle will revolve freely at a touch. The remaining screws can be put in and all screwed up taut; if one screw causes the bearings to bind, it may be slacked a shade to suit. Repeat the above operation for the saw spindle supports, and set the grooved speeds in line with each other by means of a straight-edge applied to side of largest speed on saw spindle. If the bearings are properly set, the spindles should run perfectly free, yet without any "shake" in them.

We can now fit the driving bands and have a trial run. Oil the bearings freely, and give the gear a good spin round for some time. Things may be a little stiff at first, but they will soon drop into harmony.

The fly-wheel will be found rather light for sawing purposes. It should have an addition made to its weight in the shape of an extra rim or ring of lead fastened on the outside of the present one. This ring should be not less than 2 inches deep by from $\frac{5}{8}$ to $\frac{3}{4}$ inch thick, and would weigh about 30lbs. It can easily be fixed, as the rims of the Howe wheels are generally turned "flat," so to speak. A heavy fly-wheel is most desirable, as it affords a good marginal storage of power in overcoming "knots" and "pinches" in the work.

The saw bench may be made as suits, but I have furnished a sketch of a simple and portable form, shown in Fig. 11. It may be made of $\frac{7}{16}$ or $\frac{1}{2}$ inch stuff, fitted over the bearing and collar on saw spindle, and kept as low as possible, so that the work may be brought well down in *front* of the saw. This bench is fastened down by screws, through holes provided in the table, as shown in Fig. 2 at H, H.

So much for the saw. Now a word on the emery wheel business. If a solid one is not handy, a convenient substitute may be made of wood, turned true, and a good coat of hot glue laid on, over which, before it dries, the emery must be freely sprinkled. This will be found to answer very well, and it can be renewed as required. Soft leather may be glued or pegged on instead, and the emery used with oil. A useful form is that of a disc of lead turned and faced truly, oil being also used with the emery, and the article under operation held either on the outer circumference or against the side. A handy appliance, which can be made of wood, consists of two sides or flanges, capable of being screwed together and of gripping old rags or soft leather between them. Flour emery is used with this, being dusted on as required. It is a capital assistance to obtaining a fine polish, and is cheaply made. The construction is shown in Fig. 12.

Emery wheels, or other contrivances for polishing, are best rigged up independent of a lathe. Anyone who has a good lathe, and proper respect for it, should hesitate before exposing it to the deteriorating influence of the flying "grit" which accompanies the use of emery wheels, etc., between the centres.

With regard to the drilling apparatus, Figs. 13 and 14 are a side and end elevation respectively of a rest for holding the work to be drilled against. The contrivance for advancing the work is also shown. This rest, or head, may be cast off the pattern for back centre support, with the addition of a longer boss or bearing at the top, and a modification of the centre web for taking the lever, also a tongue on the under side of the base to fit in the slot shown in table at S, Fig. 2. T is the support against which the work is held; it may be made of wood, fastened by screws to the flange on end of sliding arm A. This arm must be a good fit in the bearing, so that it will not shake and chatter. A fork or jaw is screwed on the back end of A, to carry the pin for the lever, L. This lever swings on a pin passing through the centre web of the support, as shown at P, and is provided with a handle at the top. The hole in the lever through which the pin in the fork passes must be elevated as shown, to allow free travel to the lever and the arm. The fork must also be a good fit on the sides of the lever, to keep the arm A from turning under the pressure of the drill.

With the lever, work can be advanced or withdrawn very quickly if desired. It is thus very suitable for woodwork and small holes in metal. As shown, it is capable of advancing for holes 1 inch deep. To suit the different thicknesses of work and length of drills, the slot in table at S, Fig. 2, allows the rest to be shifted to any required position within its limits, and it is fastened in the ordinary way with a nut and washer underneath.

For holding centre bits or square-ended drills, hard wood chucks are very suitable, being easily and cheaply made. The deep washer for the saw should be used to screw these against, as it covers the plain part and a little of the thread on the nose of the spindle. A small hole should be drilled in the large end, corresponding to the pin for the saw, so that the washer may "bed" well up against the collar on the spindle.

CHEST-EXPANDING BRACES:

HOW TO MAKE THEM.

YOUNG persons acquire a stooping habit from several causes, amongst which may be mentioned those of indigestion, debility, and a too intense application to study; occasionally bad training, or neglect may be added. This habit increases with

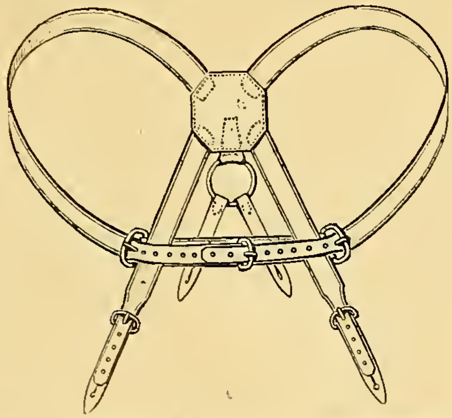


FIG. 11.—THE EXPANDING BRACE WHEN FINISHED.

age, and, if persisted in, causes a permanent deformity known as round shoulders, and the evil effects do not stop here; for round shoulders frequently indicate a narrow chest and a contracted place for lungs and stomach, with its accompaniments of chronic indigestion, headache, and shortness of breath. Persons advanced to the middle age of life grow round-shouldered by reason of their close attention to business at the desk, or the stooping posture necessarily assumed by them whilst at the bench or the work-table. It has been said that the stooping habit of young persons can be cured, and the tendency to deformity on the part of the elder ones may be avoided by wearing a pair of braces so made as to hold back the shoulders and support the back, whilst it allows the chest free action. Those braces are named chest-expanding braces, a pair of which may be made by an amateur himself from the following directions, or these will enable a worker in leather to make them to order. The measurements given are those used for a full-grown man; but these can be altered to suit the stature of the person for whom the braces are to be made.

Materials required.—A piece of brown leather, such as that used by saddlers and harness-makers, measuring 24 inches in length by 7 inches in breadth. A piece of chamois, or wash-leather, of the same size. A knot of saddler's yellow thread; a pair of saddler's or harness-maker's needles; and a sewing awl. A sail-maker's or a saddler's palm will also be found handy to push the needles through the leather. We shall also require some flat browned iron or brass buckles; two for the back strap, one for one of the shoulder-straps, and two for the front button-loops; also a ring for the back button-loops, this may be a steel split-ring, such as those used to hold bunches of large keys. Harness-makers use a special tool, or holder for the leather whilst sewing it, but it may be held in a vice, or all the stitching may be done by a boot-maker's sewing-machine.

Now for the dimensions and shapes of the different parts of the braces. First cut out two pieces the shape of Figs. 8 and 9, 23 inches long and $1\frac{1}{4}$ inches wide. Then cut out two shorter ones, 10 inches long, but of the same width, for Fig. 6. Then another piece of the same length, but $1\frac{1}{2}$ inches wide, for Fig. 7. Four pieces, 6 inches long by $\frac{3}{4}$ inch wide, should now be cut for the four loops, Figs. 2 and 5 and, if these have been cut according to the diagram Fig. 10, there will be enough leather and to spare to cut out a piece 3 inches square for the back-piece (Fig. 1), and the support for ring 3 inches by $1\frac{1}{2}$ (Fig. 3.) The dotted lines on Fig. 1 show where, the corners are to be cut off. I have not sketched loops to the buckles on Figs. 5, 7, and 8, but it will be well to stitch on some loops to these, to hold the ends of the straps.

The method of putting them together is shown at Fig. 11, where the dotted lines in back-piece show the position of ends of straps and supports. First cut out all parts to their proper shape, sew on the buckles, and pierce the holes in the ends of the straps that have to go through the buckles. Then sew on each piece in its place to

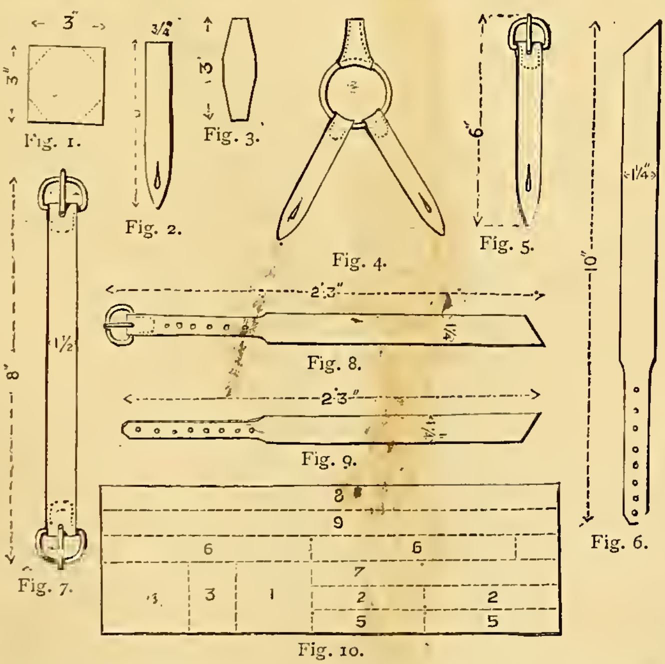


FIG. 1.—BACK PIECE. FIG. 2.—BACK BUTTON LOOPS. FIG. 3.—SUPPORT FOR RING. FIG. 4.—BACK BUTTON LOOPS, RING AND SUPPORT. FIG. 5.—FRONT BUTTON LOOPS. FIG. 6.—FRONT BUTTON STRAPS. FIG. 7.—BACK STRAP. FIGS. 8, 9.—SHOULDER STRAPS. FIG. 10.—DIAGRAM SHOWING HOW TO CUT THE LEATHER.

the back-piece, and line this piece with chamois leather, to prevent the rough edges of the other leather chafing the shirt and wearing it into holes. It will also be well to line the shoulder and back-straps with chamois leather down to the tapering part of each strap, and to carry this lining over the backs of the buckles. Well, stitch this lining to the straps, for a pair of braces thus made will almost last a life-time. In cutting the loops for the buttonholes, first pierce a hole for the shank of the button to rest in, then slit up to the proper length with a knife. If near a friendly saddler, or harness-maker, you may get him to loan you a hollow punch to pierce the holes, or you may get him to pierce them himself. In the absence of such aid, a gimlet may be used, but this will not make such clean-cut holes. The auger-bit of a drilling brace set, will be found a better substitute. To put on the braces: they must first be put up in form, as shown in sketch (Fig. 11), then put on as one would put on a coat, the back button loops must then be attached to the back buttons of the trousers, and the front button-straps, with their loops, brought under the arms, then fastened to the front buttons. If the brace is too tight, let out the back strap, or get some person to do it, for it will be found difficult to do it oneself; but wear the brace at all times as tight as it can be borne, both in work and at rest, and thus hold back the shoulders, whilst the chest is thrown forward.

ORGAN BUILDING FOR AMATEURS.

By MARK WICKS. from 490

VIII.—PEDAL ACTION: COUPLER GREAT TO PEDALS.

IN considering the question of the mechanism necessary to connect the pedal keys with the valves of the sound-board, we shall find that different arrangements of rollers, squares, trackers, or stickers, will furnish us with the means of transmitting the motion of the keys in any direction that may be required.

Rollers are needed in the pedal action for the same reasons that they are needed on the manual—viz., in consequence of the pipes being arranged alternately on each side of the organ, and being situated beyond the range of the keyboard, and in some cases brought in front of it. It may be asked "Why should we place the pipes alternately at the sides; why not have them in consecutive order and have a backfall fan frame action as for the ordinary manual action?" The answer is that the organ is better balanced by placing the pipes in alternate order, and that it prevents the speech of the pipes being interfered with by what is termed sympathy, which large pipes are specially subject to.

The rollers are fixed on a board laid flat, which, in such case is termed a roller frame, not a roller board. This board should be framed at the ends to prevent it warping; the rollers themselves should be of $\frac{3}{4}$ inch gas tubing, and made exactly as described in the chapter on the manual action. In order to prevent confusion, I have drawn the rollers much wider apart than they need actually be placed, for if they are $\frac{1}{4}$ inch apart, it will allow ample room for working, so they may be arranged on a board much narrower than that shown. They are arranged in pairs as in Fig. 106, and work in studs as previously described: the arms need not be more than $\frac{3}{4}$ inch above the rollers, so that the total height occupied by the roller frame is less than 3 inches. The holes in the roller studs and arms should be bushed with cloth to prevent rattling noises when in action.

Squares are required somewhat similar to those used in the stop action in Fig. 77; but in order to get the necessary depth of action without taking up too much height, we make them with one arm, about twice as long as the other, as in Fig. 99*a*, and according to the way the long arm is placed, so the action which is transmitted by the square is increased or reduced in extent. These squares may be made of $\frac{3}{8}$ inch mahogany in two separate pieces which are mitred together, as shown; a saw cut being made from the angle down to the dotted line, and a piece of thin veneer glued into this cut, thus making a strong joint. The long arm may be about 5 inches long, and the short one $2\frac{1}{2}$ inches. The hole for the centre to work on should be bushed with cloth; and holes must also be bored through near the end of each arm for the wires to pass through. The ordinary equal sided square which will be required in some portions of the actions is shown in Fig. 99, and is made in a similar manner to the others.

We will assume that we are going to adopt the sticker and roller action shown in Figs. 89 and 100. The squares are arranged in grooves cut in a balk of timber similar to a backfall rail, so that the ends of the long arms come under the respective pedal keys. A sticker runs from the short arm to the roller arm, and another sticker runs from the arm on the other end of the roller to a square placed under the valve of the proper channel in the pedal wind-chest, the pull-down being connected to the long top arm of this square. The action will thus be that when the pedal key is pressed down, the lower arm of the front square is pushed forwards, and carries the sticker with it, and the other end of the sticker presses against the roller arm and causes the roller to partially revolve on

its axis. This, of course, presses the other arm against the back sticker, the further end of which pushes the lower arm of the back square, bringing down the top arm, and with it the pulldown and valve. Fig. 103 shows the same action working towards the left, instead of to the right, of the pedal key. In order to prevent any waste in the height of the pedal key-board, a piece of hard wood marked C in the several figures is glued and screwed on to the top of the end of each key. This piece presses on the long arm of the front square, and thus saves rather more than an inch in the height of the key-board, which is a great acquisition.

If a pull action is required, the front square is inverted, and a short sticker glued on to the long arm as shown at S in Figs. 101, 102, and 104, so that it comes under the end of the pedal key, which would not in this case require the piece C. A tracker instead of a sticker would extend from this square to the roller arm, and a similar tracker would connect the other arm of the roller to the back square, which is turned in the opposite direction to that in the previous action. The trackers must be secured in their places by means of leather nuts screwed on to the tapped wires on the ends. Thus it will be seen that for a push action we use stickers, and for a pull action we use trackers, and either of these may be adopted as the action for Fig. 89 arrangement. In order to bring the action out clearly, I have shown all the stickers or trackers in the first octave by thick lines, and those in the second octave by thinner ones.

If the sound-board shown in Fig. 91 is adopted, the back square is not needed, as the wire in the sticker passes through a hole in a brass plate, and pushes the valve open; or if a pull action is required, the soundboard faces the other way, and the hooks on the end of the trackers would be hooked on to the pulls of the valves.

In the arrangement shown in Fig. 87, we have three different actions—viz, the direct sticker or tracker actions just described; a backward action for the pipes which are brought to the front on each side of the key-board; and the right-angled action for the pipes at the sides of the organ. The second of these actions is shown in Fig. 105, and will be readily understood. A tracker or a sticker connects the square with the roller, and a sticker or a tracker connects the other arm of the roller to the square under the pulldown if the first style of sound-board is used, or is connected directly to the valve if the second style is adopted. If a pull action is required, the sticker would be first and the tracker second; if a push action, then the tracker would be first and the sticker second, and the front square would, of course, be inverted.

The right-angled or square action is shown in Fig. 102, and requires only squares with stickers or trackers according as to whether a push or a pull action is required. It will of course be understood that this action will work either to the right or to the left, according to the way the centre square, which lays flat, is placed; and, like the other actions, it may be used for either style of sound-board. Where it is used in conjunction with the roller action, the front square should be inverted as shown in Fig. 102, in order that the trackers may pass above the rollers and not interfere with them. The roller action and the square action is arranged alternately in Fig. 87; the rollers at the back, which are shown by dotted lines, would not be required if the back pipes were only planted off from the side sound-boards, as the square action would then be used for those notes. In fact, if, as I have before suggested, the sound-boards were not returned either at the front or back, a square action would be the only kind required for all the pipes as arranged in Fig. 87. If the side pipes in Fig. 88 were only planted off on a grooving board, a roller action would be all that would be required for that arrangement. In the case of any channel that comes opposite to its own pedal key, the action may be carried direct across to it without the intervention of a roller, and where it is not very much out of the direct line, the wires of the stickers or trackers may be slightly bent so as to admit of their being carried direct across in a similar manner. A case in point is shown in the G G G sharp in Fig. 89, and it also occurs in the other arrangements.

I have now described several different methods of connecting the pedal keys to their proper valves or channels, and a careful study of the instructions and accompanying diagrams will, I think, enable the amateur to select or devise an action suitable for any position required. When the main ideas are once thoroughly grasped and understood, it is easy to make modifications to suit any requirement.

We have now only to make the coupler action connecting the great organ manual keys to the pedals, so that when the pedal keys are pressed down, their action is transmitted to the manual as well as to the pedals. This is an extremely simple piece of mechanism, and is shown in the general view in Fig. 108. A set of backfalls marked B is placed just under the key-board of the manual. A small sticker marked S connects the back end of the backfall to the manual key-tail, and a tracker connects the front end of the backfall to the front square under the pedal key-tail. This tracker is hooked on to a small loop of whipcord fixed into the square. This loop must be only just large enough for the wire to pass through. The coupler may be made either as

an octave coupler or unison coupler; thus, if the CCC pedal key is connected to the CC manual key, and so on all through, the effect of the coupler will be to bring on to the pedals as many stops as may be drawn on the manual, the 8 feet stops would sound an octave above the pedal bourdon, the 4 feet 2 octaves, and the 2 feet stop 3 octaves above the same. If, however, the CC pedal key is connected to the CC manual key, and so on from that note up to the top C in the pedals, the notes of the pedals and the manual would be in unison.

The coupler is shown in Fig. 108 as being in action, and the stop knob is drawn out. When the stop is pushed in, it causes the backfall rail or bridge of the coupler to drop about ¾ inch, and thus puts the backfalls B and the sticker S out of gear with the keys. The wires of the trackers and stickers are made long enough to allow of this drop, and the holes which they pass through in backfalls and key-tails are elongated so that the wires may work freely when the bridge is raised or depressed.

Fig. 107 shows more clearly the manner in which the stop action raises or depresses the coupler bridge and backfalls. The ends of the bridge are cut to form a shoulder or tenon, which runs between two uprights in the same manner as described for the bridge of the manual couplers. A pivot or wheel is fastened on the end of the bridge, and a roller having two arms, marked A and B, raise or depress the bridge by acting on these wheels according as the stop is pulled out or pushed in. The stop knob rod is connected to a lever E, which works on a pivot at the

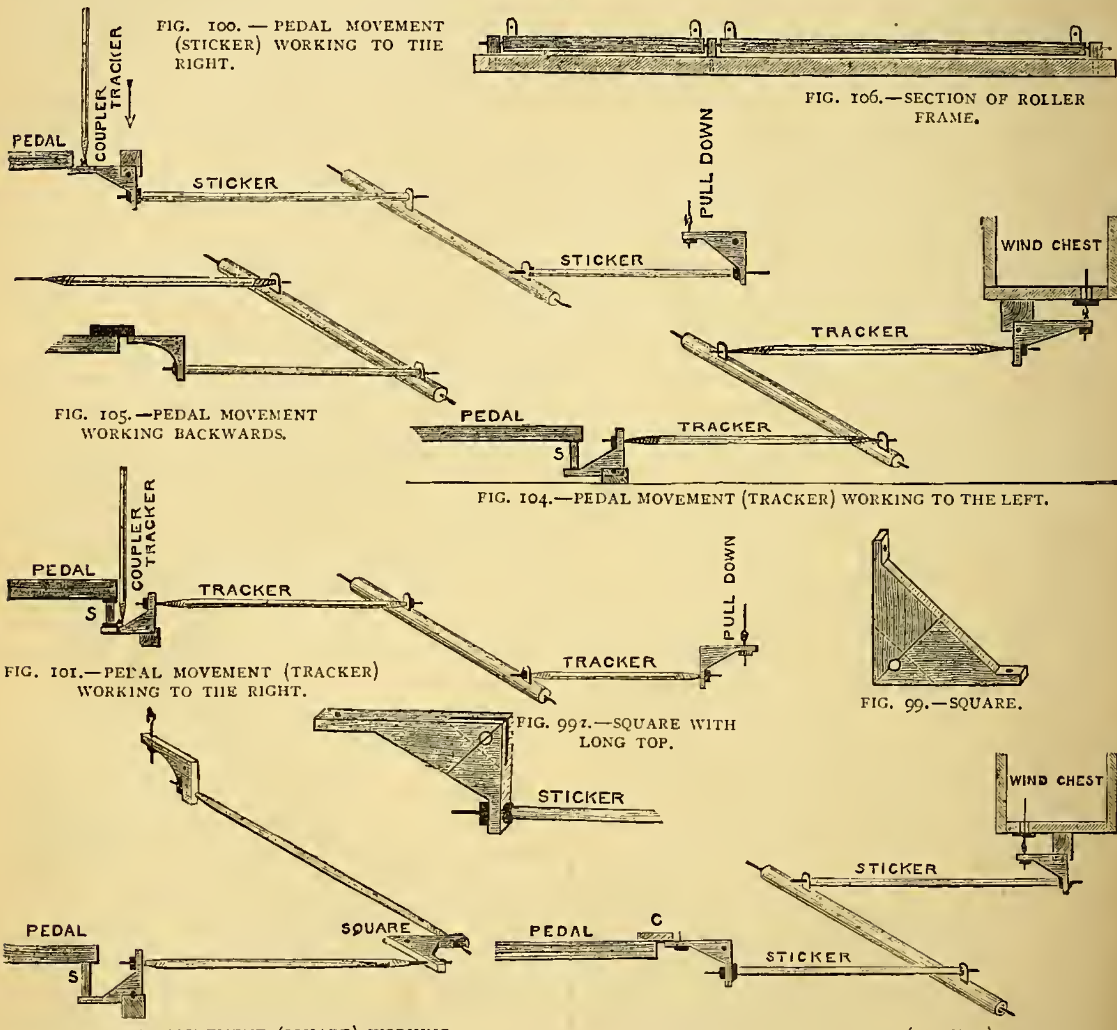


FIG. 100.—PEDAL MOVEMENT (STICKER) WORKING TO THE RIGHT.

FIG. 106.—SECTION OF ROLLER FRAME.

FIG. 105.—PEDAL MOVEMENT WORKING BACKWARDS.

FIG. 104.—PEDAL MOVEMENT (TRACKER) WORKING TO THE LEFT.

FIG. 101.—PEDAL MOVEMENT (TRACKER) WORKING TO THE RIGHT.

FIG. 99.—SQUARE.

FIG. 99*.—SQUARE WITH LONG TOP.

FIG. 102.—PEDAL MOVEMENT (SQUARE) WORKING AT RIGHT ANGLES.

FIG. 103.—PEDAL MOVEMENT (STICKER) WORKING TO THE LEFT.

bottom, and a rod D is connected to the lever and the upright arm of the roller. This sketch also shows the stop knob drawn out; when pusbed in, it would, of course, push the lever E backwards, drawing with it the arm C, thus causing the arms A and B to be lowered, and the backfall rail is thus allowed to sink down until it rests on the cross pieces at the bottom of the uprights. The roller must of course be placed sufficiently low to allow of tbe movement of the backfalls.

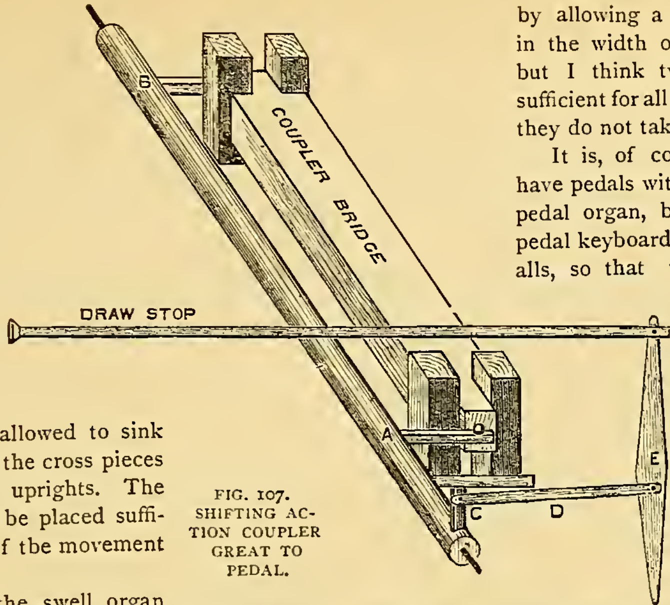


FIG. 107. SHIFTING ACTION COUPLER GREAT TO PEDAL.

A coupler from the swell organ manual to tbe pedals would be made in just the same way, and, if in addition to the one just described, it would be placed below it. Of course, if the swell to pedal coupler is required, additional height must be allowed between the floor and the manual keys. I think that one of the couplers is sufficient for the two-manual instruments which I have described.

The backfalls must be centred so that the back ends which push up the stickers do not rise more than ⅜ inch when in action, or they will force the manual keys too high. If the centre pins pass through at a point about ⅗ from the front ends, they will be about right. The depth of the pedal action is ¾ of an inch as before intimated, and that of the manuals only ⅜ inch, hence the necessity for the pins of the coupler backfalls being placed out of the centre.

If full compass pedals of 30 notes are required (running up to F instead of only to C) they may, of course, be made by allowing a proportionate increase in the width of the pedal keyboard, but I think two octaves are quite sufficient for all ordinary purposes, and they do not take up so much room.

It is, of course, quite possible to have pedals without having a separate pedal organ, by merely making the pedal keyboard and the coupler backalls, so that the pedal keys act on the manual keys only. This arrangement, whilst taking up less room and being less expensive than the other, still enables the performer to have the advantage of pedal practice, and he can use both hands on the upper part of the manual whilst playing the bass with the pedals.

The pedal keyboard is placed so that the centre C key is immediately under the middle C′ of the manual, consequently the pedal board is slightly to the left of the centre of the instrument. It need not be fixed in any way to the instrument, as the pedal keys may readily be placed so that they rest on the arms of their proper squares. A small mark or mortise on the front of the case would indicate the exact position which the keyboard should occupy, and thus, when not

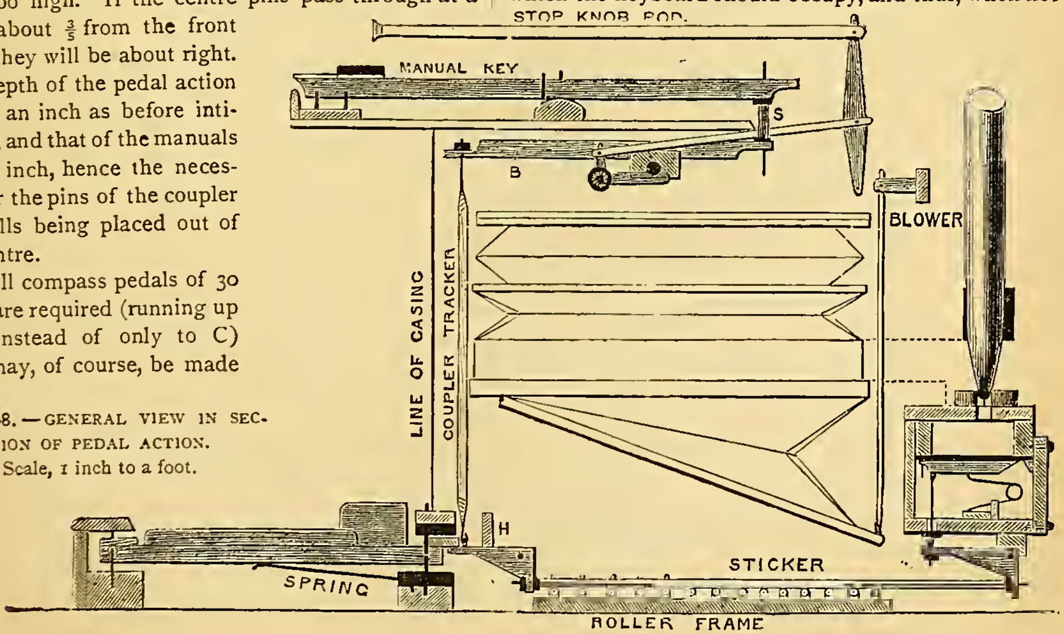


FIG. 108.—GENERAL VIEW IN SECTION OF PEDAL ACTION. Scale, 1 inch to a foot.

in use, or when the housemaid's services are called into requisition, it could be removed and placed out of the way.

A small bar of wood fixed above the front squares, and lined with cloth or baize on the under side which touches the top of them, would prevent any tendency to rising, and keep all squares in their proper place when the pedal keyboard is removed (see H, in Fig. 108.)

It will, of course, be understood that the stickers and trackers in the pedal action should be made rather stouter than those in the manual action.

If any of my readers propose placing more than one stop on the pedal sound-board, it will be necessary for them to use sliders and upper boards similar to those on the manual sound-board, and to allow the channels to be sufficiently long to supply all the stops, thus the width of the pedal sound-board would be increased. One stop on the pedals would give sufficient bass for any of the organs for which I have given specifications, but I find from the letters of correspondents that some amateurs are building organs of larger scope than those, in which cases an additional pedal stop would be an improvement.

The swell and tremulant will be descibed in my next chapter.

(*To be continued.*) v vol 3 page 63

HINTS FOR THE CONSTRUCTION OF CHEAP CHEMICAL APPARATUS.

THE study of chemistry is, to any one wishing to obtain an insight into the operations of nature, that wonderful masterpiece of Divine wisdom and benevolence, an all but indispensable pursuit. Not only, however, is a knowledge of chemistry necessary in order to become acquainted with the arcana of nature, but also that we may understand the various processes which are daily used in the different arts and manufactures; but I fear many are deterred from this useful study on account of the quantity and variety of apparatus which is absolutely necessary for its successful prosecution. Having tried, as far as possible, to construct my own apparatus, and thus avoid the cost of buying anything which I could manufacture at home, I propose in this paper to give your readers some idea of how I overcame my difficulties. I do not purpose going into minute details, but merely to give such hints as will enable anyone of ordinary ability to construct some of the apparatus most needed in the laboratory. I regard as no unimportant part of a science, which is to such a large extent experimental, the ability to construct, and, if necessary, modify, and even invent apparatus, to suit the requirements of any experiments which may be necessary. Some of the greatest masters in this science in their youthful days made use of the most ordinary materials which (by the exercise of that inventive faculty that was so eminent a feature in their characters, and that, no doubt, was sharpened to a wonderful extent by the circumstances in which they were placed) they turned into most effective instruments for the pursuit of their favourite study. Indeed, I believe that their success as experimenters was owing in no small degree to their early difficulties, and the training which they consequently received in the school of "necessity, which is the mother of invention."

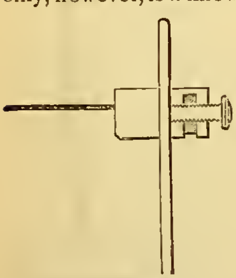


FIG. 1.—CLAMP FOR RETORT STAND. VERTICAL MID-SECTION.

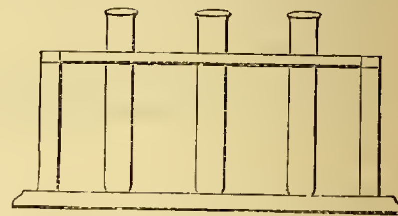


FIG. 2.—TEST TUBE FRAME.

Spirit Lamp.—One of the first things needed in the laboratory is some source of heat, and this generally takes the form of a spirit amp, or, where gas can be obtained, a Bunsen's burner, but this last could not be made by the amateur. The spirit lamp may be made from an ordinary glass ink bottle, through the cork of which a hole has been bored to admit of the insertion of a piece of glass tubing about an inch long and of the same diameter as an ordinary quill. Through the tube a piece of cotton wick is drawn, and cut off smooth about a quarter of an inch above the tube. Pour in some methylated spirit, insert the cork, apply a light, and the spirit lamp is ready to give forth its heat for any purpose for which it may be necessary. A piece of brass tubing of the required diameter will do just as well as the glass tubing; or, if neither of these is at hand, the tube may be made of tin. Remember that this is a spirit lamp,

FIG. 3.—SLATE SHELF.

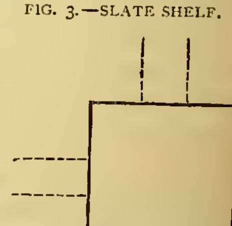


FIG. 4.—BEEHIVE SHELF. MID-SECTION.

and, consequently not suited for burning anything else.

Retort Stand.—The base of the retort stand is made of any hard wood which will take a good polish, generally mahogany; the following are very good dimensions for it:—thickness, ¾ inch; length, 10 inches; breadth, 5 inches. These, however, may be varied to any size or shape desired. The upright rod, or support, may be made of a piece of strong iron wire, such as is generally used for fencing purposes, from 9 to 18 inches long. A stair-rod cut in two makes a pair of very handsome uprights. The broken end is sharpened with a file, and fastened into the piece of wood which forms the base. The clamp may be made of a small block of hard wood, in which a nut is so fixed that its screw, on being turned, acts as a pinching screw. Fig. 1, which is a vertical mid-section of the clamp, shows, without any further explanation, how this may be done. The smaller the block of wood, consistently with strength, the neater it will look. Those who think this clamp too clumsy may purchase a brass one for about eighteenpence.

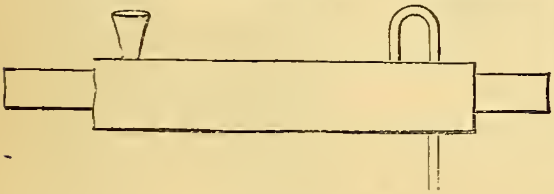


FIG. 5.—CONDENSING TUBE.

Several retort stands will be required, as they are also used for other purposes than the one which their name indicates. The rings, etc., are, of course, to be fastened into the front face of the clamp.

Test Tube Frame.—This is a thing that anyone who has seen it can make. The sketch in outline in Fig. 2 will give almost all the information needed for its construction. As some amateurs might be at a loss if they had not some measurements to guide them, I will give those which would suit for a frame holding six test tubes—5 inches by ¾ inch. Length of bottom piece, 12 inches; breadth of bottom piece, 2½ inches; thickness of bottom piece, 1 inch. Length of upper piece, 11 inches; breadth of upper piece, 1½ inch; thickness of upper piece, ⅝ inch. Length of pillars, or, supports, 2½ inches. The bottom piece will be improved by having each edge bevelled. Six holes are to be bored through the upper piece, and corresponding ones scooped out of the bottom piece; the latter may conveniently be done with a turning gouge of the proper size. The pillars will look much better if they are neatly turned. The measurements given will, of course, need to be altered for any other number or size of test tubes.

Pneumatic Trough.—A deep pie-dish, or any other like-shaped vessel, may be made into an efficient pneumatic by fitting it up with a shelf of slate, through the centre of which a hole has been made about ½ inch diameter to admit the delivery tube; small blocks of wood nailed under it will serve for feet, or it may be made to rest against the sides of the pie-dish. If a bee-hive shelf is preferred, it may be made of a tin canister through the side of which a round hole about ½ inch diameter has been cut, and also another, somewhat smaller, through the bottom. Figs. 3 and 4 will show the construction of both forms. The dotted lines in both cases show the positions of the holes.

Cork Borers.—These may be made of either brass or tin tubes, of different diameters, the edges of which have been sharpened with the file. A hole is drilled through each tube at a short distance from the other end, through which a strong piece of wire is passed to form a handle. See the diagram in AMATEUR WORK, Vol. I., p. 133.

Condensing Tube.—This can be made from a brass or tin tube 16 inches long and 1 inch in diameter, into each end of which (Fig. 5) a cork is tightly fitted. The corks are then bored to admit a glass tube 24 inches long and ½ inch diameter. This is then pushed through the corks, until there is an equal length of it projecting beyond each end of the outer tube. A hole is then made about an inch or so from each end of the outer tube; into one of these is inserted a small tin funnel, which is easily made from a piece of tin cut in the form of a triangle, the edges brought together and soldered, and a small piece of the point cut off; this is soldered into one hole. Into the other hole is fastened a syphon, which is to draw off the heated water, and thus keep up a continuous circulation of cold water about the inner tube. This syphon is most conveniently made of soft quill tubing, which is bent into the required shape by the heat of the spirit lamp. Fig. 5 is an outline of the condenser when put together. Remember that the condensing tube will be in a sloping position when in use, and adjust the funnel and syphon accordingly.

DECORATIVE CARPENTRY.

By J. GLEESON-WHITE.

V.—THE OVER-DOOR.—(*Continued*).

BEFORE dismissing the over-door it may be as well to suggest a few other forms that were crowded out of my last chapter. The design in Fig. 28 shows another form suitable for a library where bookcases carried to any given height on either side allow

the side pieces to start from the floor without being in the way. This treatment is well adapted for the door between two rooms of a town-house that occasionally is found in place of the more common folding-doors. A low bookcase running along the whole of a wall is a pleasant and useful feature to many a dining or living room, as while furnishing that wall thoroughly it takes less space than even a chair or small table would occupy; if wished, small glazed cupboards might replace the niches and shelf shown. The woodwork looks rather heavy in the drawing, but would not, I think, have that effect in actual work; the main shelf projects arms ¾ inch over the supports. Where much bric-a-brac was available, corner shelves might be added between the side pieces and the wall; a piece of wood the height and width of side uprights should be added flat to the wall in this case, with the top shelf carried right across to the width of this on either side, the ends being rounded to harmonize with the corner shelves below. The more china or glass is comfortably installed in a special niche or shelf for each piece, the better for its safety and general appearance, as it has not the air of being a new arrival or a temporary addition when placed in a recognized and suitable place, which also by isolating it adds to its apparent importance.

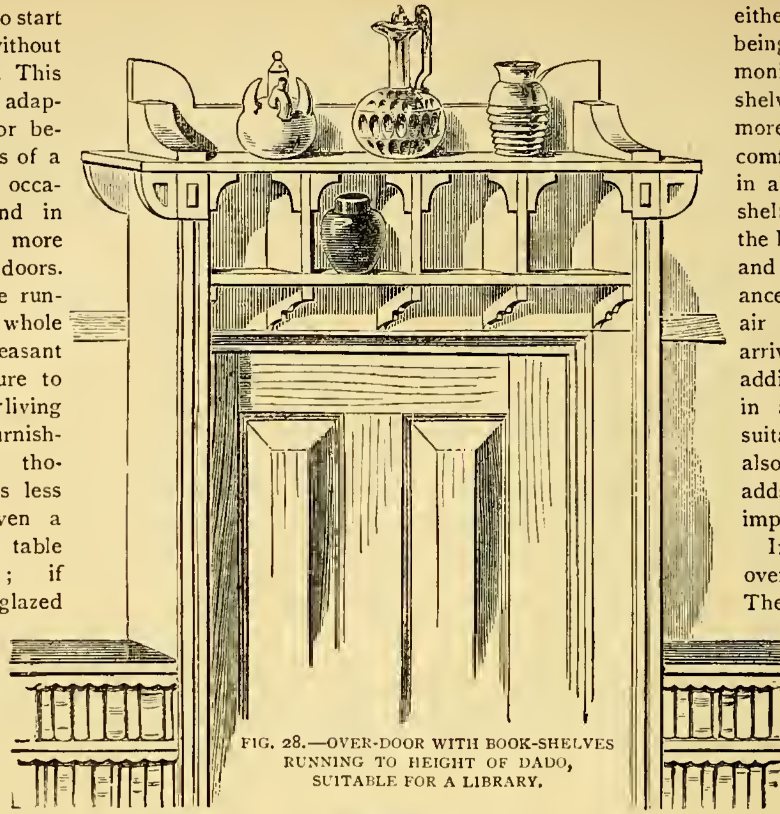


FIG. 28.—OVER-DOOR WITH BOOK-SHELVES RUNNING TO HEIGHT OF DADO, SUITABLE FOR A LIBRARY.

In Fig. 29 a Gothic over-door is shown. The turned pillars are flat against the wall, with shields decorated to taste applied to the compartments in the part immediately over the door. The brackets at side carry a shelf, bordered with a balcony of carved or fretwork in suitable pattern, only suggested by the few curves given in the drawing. The panels are intended to be treated in Gothic style to harmonize. The details should be as rich as time and circumstances will allow. This design would look best in oak, or if painted wood to match

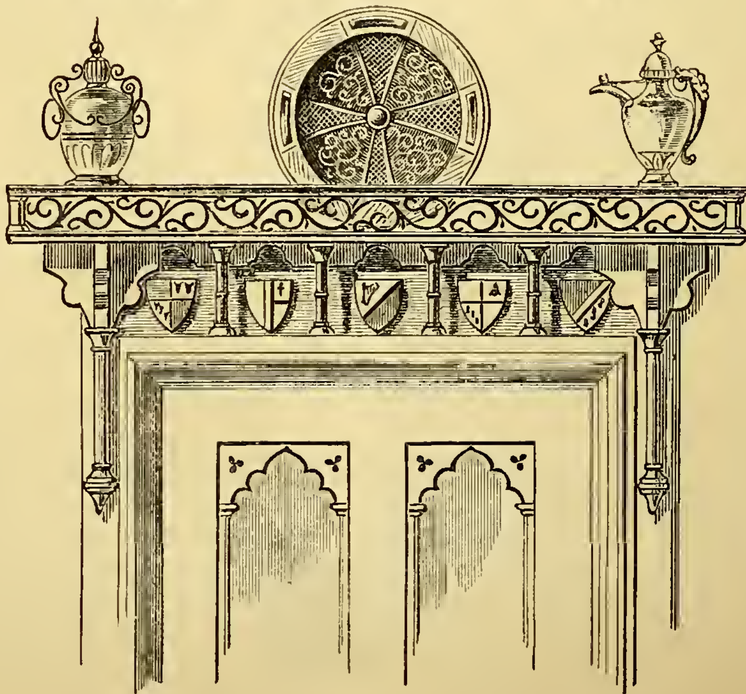


FIG. 29.—OVER-DOOR IN GOTHIC STYLE, SUITABLE FOR DINING-ROOM.

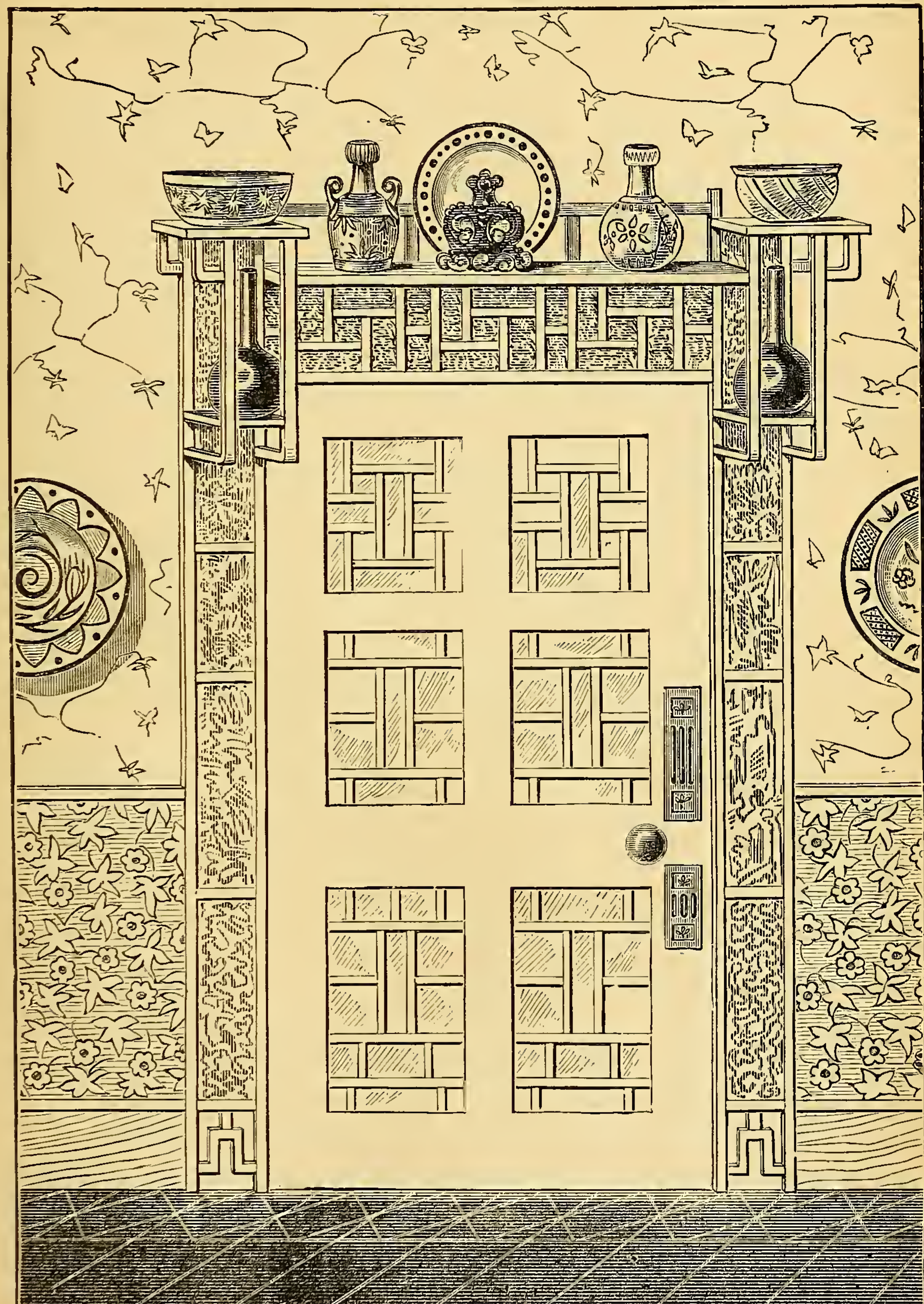


FIG. 30.—OVER-DOOR IN ANGLO-JAPANESE STYLE.

the door, a dark colour, very slightly glazed, should be chosen.

In Fig. 30 a sketch is given of the whole treatment of a doorway, in what, for want of a better term, must be called the Anglo-Japanese. This style, in the way I have planned for the door shown, is well suited for a drawing-room, being better adapted for that apartment than any that have yet been described, as a rich yet light effect is obtained at very little expense or trouble by the use of simple bars of wood $\frac{3}{4}$ inch square, or rather less, for the door frame, brackets, etc., with strips of wood from $\frac{1}{4}$ inch to $\frac{1}{2}$ inch in width, applied by needle points to the flat surfaces.

Japanese gold-laquered paper, obtainable at about 2s. a yard at Hindley's, *Oxford Street*, or any of the Japanese shops, is used to fill up the panels of the wood-framing, or (lincrusta might be used admirably here) which surrounds the doorway. A skeleton dado is shown. This should be painted like the rest of the woodwork, and enclose a paper of richer tone and design than the upper walls. It is intended that the panels with the raised strips should be painted the same colour as the relief obtained by the projection of the wood, and its consequent shadow is sufficient without further emphasis in colour. In future chapters I propose to give a few designs for panels so treated, as I think a very simple and legitimate effect is to be obtained by the use of wood applied in this way. Beyond the labour of sawing and planing the wood, the trouble is almost *nil*, while the whole may replace to some extent the intricate panelling of the Japanese Jacobean style in the ordinary house, and if the strips were dotted in other instances (not in this) with bold headed nails, I think the sham, if any, would be quite avoided by the palpable fixing of the strips indicated by the nailheads ; but this is discursive, and must be resumed later. The fixing of the woodwork is so simple a question of nails or pegs that no more need be said of that ; but it will be seen that in this case the moulding usually round a door has been removed, as the moulding would be unpleasant, coming in the square woodwork. The ordinary finish of the skirting board would be not sufficiently prominent to injure the general effect.

And now, having finished with the over-door, or at least, devoted as much space as can be spared for that part of the woodwork, I would suggest, as a safe motto, "Don't overdo the over-door," either in its frequency or in its details. The very simplest of the designs are the best in most cases. I much prefer Figs. 20, 21, or 24, 25, to any of the more elaborate ones, and find that the simple ones look very much better in actual use than they do on paper, especially as in all the drawings the aim has been to show the construction, if possible, at the sacrifice of all perspective or picturesque effect, and to some extent ruining the look of the design itself.

With regard to the bric-à-brac shown, it is astonishing how good the effect is of the rough peasant pottery of England and the Flemish and Spanish wares when placed at this height. If the owner's taste likes the painted pipkins and pitchers that now flood the land, this is at least a place where their defects of colouring and form, as a rule so painfully noticeable, will be by kindly distance dulled, and the proverbial "enchantment to the view" obtained. As no amount of picturesque beauty of a coarse jar makes it come well on a highly polished table, the involuntary sense of the rough ware scraping the polish and generally damaging the surface it rests on, shows that there is a fitness of things, misplaced when the humble pitcher is dragged from its native well to a modern drawing-room table ; but in the hall, or on these over-doors, the wide sill of a staircase window, or any similar place, the real beauty of the shape or colour is best seen without any inward fear of results.

On looking once more at the suggestions for an over-door in Anglo-Japanese style embodied in Fig. 30, I think that a few remarks may prove useful relative to the treatment of doors in this fashion, and the reduction of an ordinary door and the framework of jambs and lintel that surround it to a condition suitable for the reception of the ornamentation exhibited in the design. The better to understand my meaning let the reader glance at any ordinary door, that is to say, a door made in the method that has pertained to the making of doors throughout the present century. The framing of the panels, of which there are generally four—six-panelled doors being found only in houses of pretension with lofty rooms—consists of two styles, that is to say, side-pieces running vertically from top to bottom, and three rails running transversely between the styles and connecting them, the rail at the top of the door being of the same width as the styles and the rails in the centre, and at the bottom being about twice as wide as the top rail or styles, or, at all events, very nearly so. Grooves are ploughed in the styles and rails for the reception of the panels, and then the styles, rails, and panels are fitted into place, brought closely together with clamps, and properly secured.

This being done, we have before us a door, with rectangular panels recessed on either side of the door, about half an inch below the surface of the styles and rails. The abrupt perpendicular edge of surrounding framework of styles and rails between the surface of these parts and the surface of the panels is then relieved—palliated, if I may be permitted to use the expression—by the insertion of mouldings, mitred

together at the angles and butted against the inner edges of styles and rails, and a similar moulding is carried round the outer edge, or edge next the wall, of the jambs and superincumbent lintel. The plain door of the upper storeys is thus converted into the door with mouldings found below, or, in other words, is thus worked up into the ordinary house door.

"But," many a reader who has followed me thus far will feel inclined to urge, "the over-door in Fig. 30 has six panels, and you are talking to us about four-panelled doors, and clearly running away from your subject and figure." By no means, I must reply; it is to this very point that I am rapidly coming. My door in Fig. 30 *was* an ordinary four-panelled door, but, the first operation that it underwent while in course of conversion into an Anglo-Japanese door was the removal of all the mouldings in the panels, and at the outer edge of the doors and lintel. Having thus paved the way I inserted two transverse pieces, or, to use the technical term, slips of wood midway between the top and bottom of the upper panels, thus, in a very short time, converting my four-panelled door into one with six panels. This little piece of legerdemain accomplished, I put in the ornamental work in relief on the face of each panel with rectangular strips of wood about half-inch square in section, halving them together for strength's sake, so that the ends of the pieces, wherever practicable, were hidden and held down by the pieces that overlaid them at right angles to them. The next step was to put a thin facing of wood over the jambs and lintel. This facing was carried a little beyond and above these parts of the woodwork of the door, and overlapped the surface of the wall. The object of this was to get a wider ground for the formation of the panels at the sides and at the top, which were formed by screwing slips to the facing along either edge and putting in transverse pieces between them at intervals, as shown in Fig. 30.

The remainder of the work needs no explanation, but the above, I think, was necessary for the enlightenment of some, who might have been somewhat puzzled if I had omitted to give it.

(*To be continued.*)

TWO DESIGNS FOR WALL-BRACKETS.

By G. GIBBONS.

I.—A BRACKET FOR FRET-CUTTERS.

NOTHING affords so great an opportunity of displaying one's taste as in the choice selection of wall-brackets. There is such an immense variety of these articles in the market at present, that it is really often a perplexing affair to decide which to have—whether a modest shelf supported on a bracket covered with cloth or velvet, or a more elaborate one with, perhaps, a mirror above the shelf; or again, it may be that one would like to have an article in which the cabinet-maker's skill would be brought into play. For the benefit of those of our readers who prefer the latter species of brackets, I have produced two designs adapted to two different classes of industry—fret-cutting and turning. In the one, the ornamental portion is entirely composed of work from the fret-saw, while in the other, no other ornament than can be produced from the lathe has been employed. They are also in totally different styles of design, so that though some people may prefer one, others may rather have its neighbour.

The first of these designs, namely, that of the bracket adapted to meet the wishes and requirements of fret-cutters appears in this present Part, but owing to the difficulty in finding room for the two sets of drawings together, the bracket for turners must be of necessity deferred to a future Part; and, perhaps (the Editor and readers being willing), I may, subsequently, have something to say about brackets in which cloth, velvet, or plush compose the principal feature in the finished article.

I will now describe the bracket in which fret-cutting forms the ornamentation, shown in Fig. 1, which must be made on a scale of four times the size drawn, so that the first thing to be done is to draw it out full size on paper. See that you get the curves of the ornament along the top and immediately above the shelf to run well and fluently—that is, do not have them the least crooked or broken-backed, or they will never look well. For those who are accustomed to freehand drawing such as this, I will describe a method that, although perhaps a little tedious at first, will be sure to get the thing right. Take the illustration and on the bit you wish to enlarge rule lines at right angles to each other $\frac{1}{8}$ inch apart. Then, on the larger drawing you are making, rule lines in the same way $\frac{1}{2}$ inch apart. Now you can easily determine the points where the curves intersect the straight lines. If a curve in the figure intersects a vertical line at one-fourth of the distance between two horizontal lines, then on your drawing you mark a point on the corresponding vertical line at one-fourth distance between the corresponding horizontal lines, and in the same way any and all of the points may be marked, and the curves, when drawn through these points, *must* be correct.

The ornament running up the sides is all geometrical work, being circles and quarter circles, and little difficulty will be found in setting these out.

When the design has been drawn out on paper it will require to be transferred to the wood for cutting out. This

may be managed by pinning the drawing on the wood and slipping a piece of carbonic paper underneath, so that by going over the design with a hard point (a "tracer" is the special instrument for this; it is generally a stone ground to a point and set in a handle), and pressing lightly, an exact impression will be found underneath.

The plan I generally adopt, and which I find to work splendidly, is to take a tracing of the design on ordinary "tissue" paper, using, of course, a soft pencil, and gumming or pasting this tracing on the wood. After the pattern is cut, a very slight damping will soften the paper, and it will come off readily.

The bracket proper must now be cut out of ¾ inch wood, and when the rebate on the back to receive the glass has been formed, and the shelf and bracket underneath have been fitted into their places, the fret-saw takes up its work. The fretting, as must have been noticed, is cut and glued on the face of the bracket, giving a good solid job, and though not so light and fancy looking as the ordinary way of having fret-work, it has the advantage of being strong and not the least likely to snap with handling. The fret must be cut out of wood barely ⅕ inch thick; if thinner, there is not the light and shade that is so much needed in this class of work. Great care must, of course, be exercised in cutting the scrolls at top and bottom of the glass. It would be as well when cutting them to have another board at the back, say ¼ inch thick, keeping them together with needle-points, and having the grain of the two woods running in opposite directions.

In the fret underneath the shelf, the veining of the leaves

FIG. I.—BRACKET IN FRETWORK. FRONT VIEW.
Scale, one-fourth full size, or three inches to the foot.

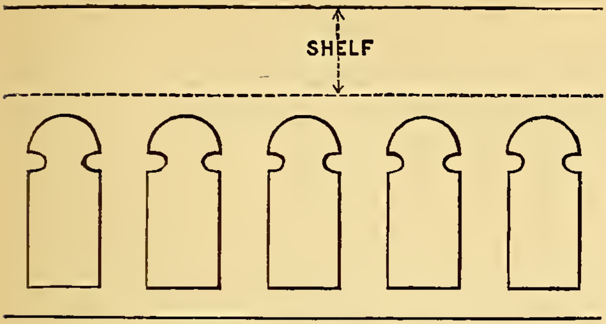


FIG. 5.—DETAIL OF SHELF EDGE. FULL SIZE.

FIG. 3.—SECTION THROUGH FRAME AT A. FULL SIZE.

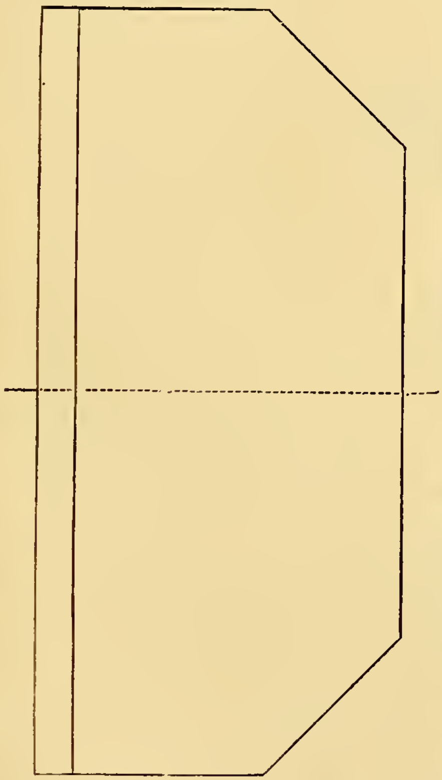


FIG. 4.—PLAN OF SHELF. SCALE, ONE-FOURTH FULL SIZE.

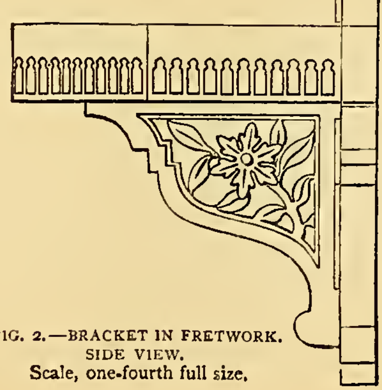


FIG. 2.—BRACKET IN FRETWORK.
SIDE VIEW.
Scale, one-fourth full size.

and the petals of the flowers may be taken out with the chisel, or they may be saw cuts; the latter would, perhaps, be more strictly in keeping with the fret-work.

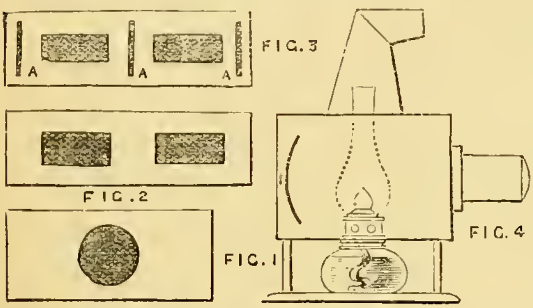
When these have been all cut out, proceed to glue them in their places. Having marked in pencil the spots where each corner will come, spread a thin coat of glue over the fret, being careful not to put too much on or to let it run down the edges. Lay the fret carefully down exactly on the spot it is to occupy, and put a board above it at once with a weight on it, and do not move it till it has had time to set thoroughly, when the other pieces will, of course, be added. The fret on the edge of the shelf has a good hold, extending right up to the top edge of the shelf; sometimes this fret is put on projecting up instead of down, which may be, with some, preferable. In the top corners of the glass there is a little corner piece of fret-work. This will require a check the exact thickness and length of the fret, which check must, of course, come out of the rebate made to receive the glass. When these are glued in and the glass put in its place, the sprigging in of the back-board and the fixing of the shelf and bracket will complete the job.

This bracket might be made of two different woods, the fret one kind and the background to the fret of another; but beware of having too great a contrast. I have seen boxwood and black walnut used together, and the result was far from satisfactory, simply because of the great contrast between the woods. If the amateur were making this in pine and staining it, he could easily give the fret a second coat of stain, which would give something of the effect of two woods being used.

WAYS AND MEANS.

[The Receipts brought together under this title are gathered from various sources. They are given here because they are each and all apparently possessed of value, and likely to be useful to the Amateur. It is manifestly impossible for the Editor to test them, or to have them tested, and he therefore disclaims all responsibility for their accuracy or otherwise. Amateurs who may try them are requested to communicate the results arrived at.]

Paper Slides for the Magic Lantern.—Procure a coloured print the size required for your lantern. The colours used on the print must be transparent colours—otherwise, get another; next get a frame, either of wood or cardboard, or stiff paper, cut out the centre, as in Fig. 1, or, better, as in Fig. 2; the shape of the hole cut, however, must depend on the subject of the paper picture to be treated. Gum or paste the picture quite tight over the opening. This requires great care, as any paste or gum on the picture spoils it. In choosing the paper picture, the quality of the paper must be looked at, the thinner the paper the better, as it makes a better transparency. If your picture is on a stout paper, then after framing it sand-paper



PAPER SLIDES FOR MAGIC LANTERN.
Figs. 1 and 2. Mounts for Prints. Fig. 3. Mode of Protecting Prints. Fig. 4. Lantern with Duplex Lamp.

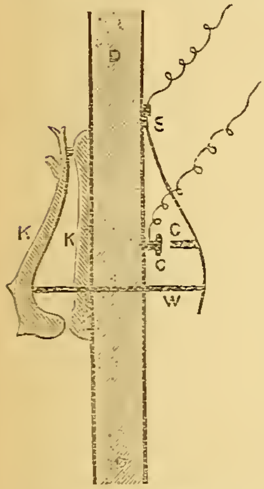
the back as low as you can, this applies also to photographs on thick paper. The sheets of German pictures that are occasionally met with in booksellers' and stationers' shops, coloured or not coloured, make first-rate slides, as the comic attitudes and positions cause great amusement; further, each set has a tale connected with it, which can be related during the exhibition of the slides. Photographs, prints or sketches by hand—the last named may be traced on fine linen—should all be treated alike, but coloured afterwards according to taste. See that the frame and picture is quite dry and clean; now get Canada Balsam and mix with it turpentine in the following proportions: For No. 1, 1 part Canada Balsam, 2 parts Spirits of Turpentine, or No. 2, 2 parts Canada Balsam, 2 parts Terrebene, 1 part Boiled Linseed Oil. The above mixtures should be used only in a warm room. No. 3, 1 part Canada Balsam, 3 parts Chloroform. These all require to be mixed in wide glass-stoppered bottles. I have given three processes, but each one has its merits and will meet the requirements of any picture. Now pour a small quantity of either (choose your own medium) on the back of the framed picture (not the front, as the coloured matter must be attached from behind to prevent the paper becoming neutral), and with the finger rub it well round and round, and hard, so as to rub it well into the paper. No. 1 and 2 act better if the bottle is kept warm whilst in use, as they flow better. As the rubbing proceeds, the paper becomes perfectly transparent; now put on some more, and continue rubbing till the surface looks glazed and the picture is transparent, now let it get dry—as far as No. 1 and 2 are concerned depends on the heat or moisture of the room, but No. 3 will dry in a few minutes, and sometimes too quick; if so, put more on. When quite dry, the picture thus treated should present a highly varnished surface, quite smooth and free from any stickiness. If it be found that all the surface is not glazed, do it over again; also, at the same time apply the varnish to the other side, which ought to add a further lustre to the picture. When quite dry—which requires a few days and plenty of air—gum on the frame some pieces of cardboard, as shown at A, A, A, in Fig. 3, as when packed together any damp or warmth might make them stick, and being thus protected it prevents such a calamity. Prints or photographs can be treated in the same way, and painted in oil or water-colours afterwards. Transparent pieces of gelatine on separate slides make a good effect. Comic slips—in fact, any kind of glass magic-lantern slide—can be imitated in paper with similar effect. I have tried these pictures with a 2s. 6d. lantern with great success. I may as well suggest here a simple way to procure a good lamp for any lantern. Get a Duplex paraffin lamp, cut out the bottom of your lantern and put it over the lamp on a frame, as in Fig. 4. The reservoir is thus kept cool, being below the lantern, hence no danger can arise from this process. A large number of slides may be carried or sent through the post without damage. No. 1 I fancy affords the surest means of success, especially in photographs, but if the paper is stout then No. 2, as the oil penetrates it thoroughly. No. 3 makes a good varnish to finish off any of them. [C.]

Cheap and Strong Drawing-Pins.—Take a small brass disk about ⅝ in. across with a hole in centre (they are used for the ends of rivets), and lay it on a thick piece of straw-board, cork will do as well, then drive through the centre of disk a shoemaker's brad or rivet, about ¼ in. long (such as are used in boot-making), until it is driven down flush with top of disk; now drop on top a bead of solder, and work it round with the soldering iron until top is covered with solder. When cold file up the point. If many are wanted it is quicker to make them in a row and so solder the top one after the other. [G. S. A.]

Fire and Waterproof Cement.—Add half a pint of milk to half a pint of vinegar. Strain off the whey and mix into it the whites only of five eggs. Beat the mixture well together, and sift into it sufficient quicklime to make a thick paste. [H. E. H.]

Knock and Ring.—It may interest some of our readers to know how I accomplished this *desideratum*. In the house that I occupy the knocker is so light, that frequently when in a back room I could not hear any one knocking at the front door, and to cure this evil I hit upon the following plan, which, so far as I am aware, is perfectly original: I drilled a ⅜ inch hole in that part of the knocker which is fastened to the door, and also a hole in the door itself, just behind this; then from a piece of thin hammered brass I made a bent spring (s). One end of the spring I screwed

to tbe door *inside*, to the other end I fastened, by riveting at right angles, a piece of $\frac{1}{8}$ incb iron wire (W) sufficient in length to reacb tbrough the door to the back of the moveable part of tbe knocker, with perhaps an $\frac{1}{8}$ inch to spare. The reason I bent the spring was that I could, between it and the door, drive a big-headed brass nail (C). To the brass nail I soldered the end of a copper wire, to the spring I soldered another wire, these two wires I lead to an electric bell and battery. The action of the foregoing contrivance is this, when the knocker is raised the iron wire is forced out by the spring, and the spring makes contact with the brass nails and completes the circuit, and, of course, rings the bell. When tbe knocker is at rest, its weight forces the iron wire inwards, and with it the spring, and breaks contact, and bell ceases to ring. I must add one word of perhaps unnecessary warning, take care that the spring is not made too strong, the weight of the knocker *must* overbalance tbe strength of the spring, otherwise the contact would be constant instead of only being made when tbe knocker is raised. This arrangement does away with the troublesome job, for an amateur, of drilling the stonework of the doorway, and besides dispenses with the expense of a contact push. [POLITZER.]



KNOCK AND RING.
K, Knocker; D, Door in section; W, Iron wire; C C. Contact; S, Spring.

EMERY WHEEL *v.* GRINDSTONE.—An emery hone may be used in the same way as an ordinary rough stone for coarse grinding. It cuts very fast, but wears pretty rapidly. For sharpening pocket-knives it is better than a grindstone. Experience has shown that emery is an excellent substitute for natural stones for rough work. In general, emery grinding is done dry, and, though very rapid, it is found practicable to grind cutting tools without drawing the temper. Rouge and flour emery is sometimes spread on pine sticks and used for honing tools. In this case the pine stick was cut to fit the faces of the tools, which were curved, and the rouge rubbed into the wood. It is said that razors may be honed in this way without the use of the oil stone.

RETINNING SMALL WARE.—The general process of retinning is to dip the articles into a vat or ladle of melted tin; this is covered and protected by a coating of palm oil; drain them, rub with tow to remove superfluous tin, and finally put them through a bath or "washpot" of the finest tin. The operation is not one which can be done economically on a small scale. It is said that the retinning of small articles may be effected by heating them to the melting point of tin, and then rubbing them inside and out with scraps of block tin, and getting the surface smooth with a bunch of tow.

FASTENING LABELS ON TIN.—Common gum-arabic, dissolved in water, makes the best mucilage. It should be made pretty thick, and a lump of washing soda $\frac{1}{4}$ inch in diameter, should be added to each half pint, and also a half of a teaspoonful of glycerine or more, as may be needed. A little tannic acid added to ordinary glue will make labels adhere very well to tin, but it stains the tin. Another mucilage for this purpose consists of 1 part by weight of gum of tragacanth, 6 parts of glycerine and 80 parts of water. The gum is powdered and the glycerine added. The water is slowly added, while the mass is rubbed down until it forms a smooth paste. Varnish forms a good medium for sticking labels to metals of any kind.

NOTES ON NOVELTIES.

MY first duty this month is to confess a sin of omission, and to make amends for it in the best way I can. When noticing "The Journal of Decorative Art," published by Mr. H. Vickers, 317, *Strand, W.C.*, in the July part of this Magazine, I did not name the price. As my notice has brought inquiries about this, I take the opportunity to say that, "The Journal of Decorative Art" is published in monthly parts, at 7d., and in yearly volumes, bound in cloth, at 9s.

In a letter written in February last, I note that the Manager of the BRITANNIA COMPANY, *Colchester*, says:—"We are also about to introduce a cheap circular saw-bench. If we can get orders for quantity, we hope to sell them at £5. It is what many amateurs want." I have not heard anything further respecting this saw-bench, but as it is, as the Manager says, a thing that many amateurs want, I mention it here to draw the attention of my readers to the fact that the Britannia Company propose to provide for this want. The machine, when made, should be powerful enough to do much rougher work than can be managed with a saw mounted on a lathe.

Mr. A. S. Lunt, Tool Maker, etc., 297, *Hackney Road, E.*, sends me a very brief prospectus of an "Improved Carpenters' and Joiners' Bench-Stop," half of which is taken up by an engraving of the article, while the remainder is occupied by the name of the bench-stop as already given, and the following remark:—"The ordinary bench-stop, of which this is an improvement, is so well known as to need no description; it will suffice to say that this is the best and cheapest in the market." The price of the stop is 1s., or 1s. 3d. free by post. My readers would, of course, like to know the points in which this improved bench-stop differs from, and is better than, the ordinary bench-stop. Mr. Lunt does not send a specimen of the article he wishes me to notice; and as the engraving and the remark I have quoted do not help me in the matter, I must reserve my comments on it until I have had an opportunity of examining it.

Messrs. Stevens and Co., of the "Torbay Paint Company," exclusive makers of "Calley's Torbay Paint," whose works are at *Brixham, Torbay, Devon*, and whose London offices are 26, 27, and 28, *Billiter Street, E.C.*, have sent

specimens of their colours, accompanied by a price list, giving prices per cwt. of their different paints and other specialites. In this price list is a coloured plate giving fifty-four specimens of colours manufactured by the Company, a thing which in itself is invaluable to amateurs, who are often puzzled to judge of colours, and their probable effect when laid on, from the name only. The colours are sold in the form of "paste," which requires the addition of boiled oil or turps, or a mixed oil supplied by the Company, in order to reduce them to a proper paint consistency, or perfectly ready for use. The prices per cwt. range from 30s. to 60s. in paste, and from 33s. to 50s. ready for use, the difference between the prices of the two forms in which the colours are sent out, being for the most part 3s. per cwt. Signal red, however, a brilliant and beautiful colour, is sold ready for use only, at 112s. per cwt., while golden brown is the same price in both forms; ivory white, 38s. paste, and 44s. ready for use; lemon yellow 55s. in paste, and 48s. ready for use; and orange 60s. in paste, and 50s. ready for use. I mention the "Torbay Paint" now in order to draw attention to it, and acknowledge the receipt of specimens from the firm. When I have had time to test the paints sent, I will again refer to the subject. The colours are cheap in bulk, but I do not gather from the prospectus the prices at which they are supplied in smaller quantities.

The Indestructible Paint Company (Limited), 27, *Cannon Street, E.C.*, noticing some remarks that were made in "Amateurs in Council," in the July part of this Magazine on the Solution—"Browning's Colourless Preservative Solution"—that is manufactured by them for coating stone, etc., and preserving it from decay and discoloration through the action of the weather and vegetable growths, have sent me some interesting particulars respecting its good qualities contained in testimonials from various persons who have used and tested it. These particulars will doubtless be sent to any applicant who may wish to apply the solution to any stone work or brick work requiring protection from the weather. When applied to the stone work, etc., the solution hardens and forms a coating impervious to rain even in the most exposed situations. The cost is 6s. 6d. per gallon, and this quantity is sufficient for giving two coats to a superficial extent of from eight to ten square yards. One fertile cause of damp in walls is the miserable way in which they have been built by the bricklayer or mason, and the wretched quality of the mortar used, chinks and crannies being left between the bricks, etc., both in the interior of the wall, and the external surface through which the wet percolates, finding its way in due time to the plaster within. I recommend anyone who is contemplating using this or any other solution of the kind, to have his walls well pointed before using the solution. I have heard disappointment expressed because the desired results had not followed the use of a solution; but I am inclined to think that it was caused by the imperfect condition of the wall, or the joints in the brick or stone work, and not by the solution being unfit for the purpose for which it was used. No solution can stop wet from entering holes such as are often seen in badly-built walls.

Mr. G. C. Pulford, 77, *Cannon Street, E.C.*, better known as the manufacturer and inventor of "Pulford's Magnetic Paint," sends a specimen form of a "Railway Carriage Telegram," to be hung up in blocks resembling block sketch books, for the use of railway travellers, the forms to be collected at the more important stations along the line for transmission to their destination. The idea is well worth consideration, as it would afford facilities to business men, commercial travellers, etc., for transacting business *en route* from place to place, and to persons on a journey for announcing their safe arrival, etc.; and this has been promised by the Postmaster-General.

Messrs. D. H. Cussons and Co., 79, *Bold Street, Liverpool*, have just published a work that cannot fail to be useful to amateur photographers, under the title of "The Amateurs' First Handbook," a Complete Guide and Instructor in the Art and Practice of Modern Dry Plate Photography, illustrated with woodcuts, by J. H. T. Ellerbeck, late President of the Liverpool Amateur Photographic Society. The price of the book, which is $7\frac{1}{8}$ in. by $4\frac{3}{4}$ in., and contains 68 pages, besides blank pages for memoranda, and many pages of trade advertisements, costs 1s. The author tells us in his introduction that his "aim is to teach a novice how to select and use the tools he requires, to understand the causes of failure, and therefore how to avoid them." The book touches briefly but clearly in its fifteen chapters upon everything that it is needful for a beginner to know and to beware of, and cannot fail to be useful to anyone who has commenced, or is about to begin to practise this beautiful art.


NEW HANDLE FOR BRADAWLS.

For amateur carpenters, I have something to say about a handy little novelty that has been sent me by Messrs. R. Melhuish and Sons, 85 and 87, *Fetter Lane, E.C.*, which is figured in the accompanying illustration, and which ought to find a place in every wood-worker's collection of tools, partly on account of its utility, and partly because it occupies so little space, when compared with the number of handled bradawls that it represents. The handle, with 12 bradawls of different sizes, is sold for 1s. 2d. Each bradawl, whether large or small, has a square shank, which fits into the iron heading to the handle, the end of the shank appearing through the hole in the iron, as shown in the illustration. The bradawls fit tightly into the iron, and are kept well in place by the resistance offered by the wood into which the blade is thrust. If the shank sticks into the socket too tightly to be pulled out with the fingers, it can be expelled by thrusting another of the bradawls into the hole, and using it as a lever. Here, then, we have twelve tools in the space that is usually occupied by one only! The same idea might be carried out for gimlets, chisels, gouges, and all tools that are handled as these are, causing great gain to those who use them, both in the diminished space they would occupy and their increased portability. To wood carvers especially this would be a great boon.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine. The information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Interchange of Supplements for Parts XXI. and XXIII.

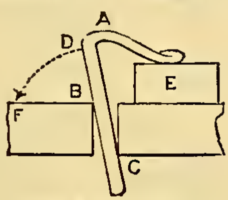
The Publishers have requested me to express their regret that owing to an unfortunate mistake on the part of the binder, the Supplement containing Working Drawings of the FANCY JARDINIERE, which was intended to accompany Part XXIII., was stitched up with Part XXI., and the greater part of the Edition sent out before the error was discovered. Notice has already been given to as many readers and subscribers as possible of the mistake that has been made, and the only way to remedy it as far as it is possible to do so, is to say that the Supplement in illustration of the "Combination Saw Stand" will be presented with Part XXIII. for October, in which will be found the description of the "Fancy Jardinière" that was unintentionally issued with Part XXI. for August.

Finsbury School of Amateur Mechanics.

I have much pleasure in calling the attention of readers of AMATEUR WORK, residing in London and the suburbs, to the abovenamed practical school of carpentry, which will be opened for the Michaelmas term on Wednesday, September 26, 1883, at the workshops, *Finsbury Square Buildings, Chiswell Street, E.C.*, by the Principal, Mr. Thomas J. Syer (Certificated, Enfield, 1875. Silver Medallist, Tottenham, 1878), assisted by competent workmen in each class. There will be classes for (1) Cabinet Work and Carpentry; (2) Wood Carving and Engraving; and (3) Wood Turning and Fret Cutting. Beginners will have the necessary tools lent to them by Mr. Syer, but students in the advanced classes are recommended to provide themselves with their own tools and appliances. The classes are commenced with the object of giving practical instruction to gentlemen desirous of learning the use of tools, an especial feature being that all who attend them will be taught the manufacture of various articles with the tools ordinarily used by mechanics, and without the aid of costly machinery. There will be three terms in the year, commencing in September, January, and April, the term's fee for beginners being £1 1s., and for advanced students, £1 11s. 6d. The average number of lessons in a term will be twelve. The prospectus and any information required can be obtained of the Principal or of the Secretary, Mr. W. J. CROWHURST, at the above address, or 1, *Finsbury Street, Chiswell Street, E.C.* I may be permitted to point out that the cost of the tools and plant required for an undertaking of this kind is considerable, and that a large number of pupils must be gathered together in order to render it remunerative to Mr. Syer. His scheme is an excellent one, and I wish it the success it deserves, and that he may soon find imitators in all the large towns throughout the kingdom. A little showing by a competent hand is wonderfully helpful to an amateur, and I strongly recommend those who are near enough to Mr. Syer's school to put in an appearance there, from 6 p.m. to 9 p.m. in the evening on Mondays and Wednesdays, to take advantage of the assistance that he is able and ready to render them.

Bench Holdfast.

E. W. (*Richmond*) writes:—I have always seen the Bench Holdfast described in books in the same way as it is by E. H. B., p. 399. It seems to me, however, that the principle is misunderstood, and that, as drawn, the tool would have no holding power whatever. The annexed diagram explains what I believe to be the true theory. A blow on the head at A, drives the tool home, causing it to jamb against the hole in the bench at B and C. It is usually said to jamb at the two points directly opposite to these. Owing to the leverage of the long arm, any tendency of the work E to rise, throws the tool backwards towards F, thereby increasing the pressure at B and C.



BENCH HOLDFAST.

It is generally said that the tool acts through their being little tendency of the work to rise, but the fact is, that the greater the tendency to rise, the stronger is the grip with which it is held down. A blow at the back of the tool at D, by bringing the stem to the perpendicular, allows it to slip through the hole, and frees the work.

Octopus Glue.

VICTOR writes:—I can quite confirm CLERICUS in his opinion of this article, having tried it as size in the usual way as common glue size, but it did not answer at all. The varnish that was used after the size turned as if it had been put on wood covered with oil, and would not dry. Also tried it in various other ways, but with no satisfactory result.

Saw-filing.

W. H. T. (*Nottingham*) writes:—I once saw a book advertised in your Magazine on the "Art of Saw-filing," but have looked for it since and have not been able to find it. Can you tell me where to procure it? [I am not aware that any book on Saw-filing has been advertised in AMATEUR WORK.—ED.]

Painting Tables, etc.

AMATEUR, U.S.A.—1. In reply to your request for instructions in making and painting or otherwise decorating small tables and other articles of furniture, I may say that directions for the construction of tables of various sorts, shapes, and sizes are given in "Every Man His Own Mechanic," and will be given from time to time in this Magazine. So many excellent works are to be found to aid the self-taught in painting in oils, that it has been thought unnecessary to treat of this in AMATEUR WORK, unless in connection with, and reference to, special subjects. Excellence in painting proceeds from a natural gift in the first place, combined and supplemented by practice. It is not everybody who took a fancy to painting in oils that would eventually be capable of painting a table, and getting five pounds for it when painted. There is not a very large public that can indulge in purchases of this kind, and for all productions of this class by amateurs the difficulty is to find a market. The writer of the paper to which you allude was exceptionally fortunate. 2. The second portion of your letter will be answered in another part of this section of the Magazine. A Sale and Exchange Column was started in AMATEUR WORK a little time ago, but it did not find favour, and was therefore discontinued. As you are living in the States, I do not see much hope of getting an offer for your clarionet in this country. You will, I am of opinion, have a far better chance of selling or exchanging it where you are. You wish to make an exchange for some good instrument. You have not taken the matter of carriage into account for an interchange of instruments and the risk of loss or damage in transit.

Fretwork Case for Clock.

GRAPHIC.—It is always a pleasure to me to have applications from the colonies and distant parts of the world. I have sent your inquiry about a fretwork design for a small clock-case, mentioning your wants in detail, to Messrs. Harger Brothers, *Settle, Yorkshire*, and they will doubtless communicate with you, though it is some distance between *Yorkshire* and *Launceston, Tasmania*.

INFORMATION SUPPLIED.

French Polishing.

H. S. (*Hackney*) writes: I beg to inform T. H. (*Settle*) that I find it quite easy to French polish fretwork. First of all fix the work flat on a piece of wood, so that you have something to catch hold of. Then follow the directions given in the article on "French Polishing and Spirit Varnishing," in Part VI., leaving out the filling altogether, and substituting No. 0 sand-paper for the pumice-stone powder, and being careful not to use the same part of the rag too long. Of course, this only applies to work that is not too fine.

Pipes from Potatoes.

CHEMICALS sends the following further reply to LIGHT-KEEPER:—I have tried the above experiment, and cannot get anything at all like the substance you state; nothing but a nasty smelling substance remaining. Another point at which I found a difficulty, was the squeezing out the moisture; in fact, with all the appliances I could command, I could not manage to do it in the manner your extract seems to point out. Should you attempt the experiment, kindly let me know the result.

Norwegian Cooking Stove.

G. E. writes in reply to M. V. T.:—Having either lost or mislaid my notes on the construction of this apparatus, I must trust entirely to memory. Briefly described, it may be said to be a wooden box enclosing another box made of tin. The outer or wooden box may be square or oblong, deep or shallow, small or large, just as may be deemed suitable to the requirements of its owner, but it must be strong, jointed closely and fitted with a close fitting lid. The inner or tin box should be made two inches less in length, breadth and height than the outer box, the space between the sides and the bottoms of the two boxes being closely padded with thick blanket or felt. The tin box must also have a close-fitting lid, and the lid of the outer box should be so padded with felt as to fit close down on the tin lid or cover when the inner box is closed. When thus constructed it forms an excellently cool cellar wherein butter, meat, etc., can be kept cool in summer. To make it suitable for a cooking apparatus it will be necessary to have the tin box made with double sides and bottom, so as to allow a space of half an inch all around, and to fit pipes or other means of filling the space with hot water, or drawing it off when cold. Suitable vessels constructed in block tin are also made to fit the interior of the tin box. Now, to cook a Sunday's dinner, you have only to partly roast or boil the meat by the ordinary means and also to pour boiling water on the vegetables contained in the special vessels, then fill up the hollow space inside the jacket of the tin box with boiling water, put the meat, vegetables, etc., in their several places in the apparatus, close the lids securely and the cooking will go on inside, whilst you are absent from home, with the certainty that the dinner will be hot whenever you return, and that the meat will not be dried, burnt, or overdone.

L. M. T. D. (*Glasgow*) sends the following extract from Professor Pepper's "Cyclopædic Science Simplified," for the information of M. V. T.:—"The principle on which this cooking apparatus acts, is that of retaining the heat; and it consists of a heat-retainer, or isolating apparatus, shaped something like a refrigerator, and of one or more saucepans or other cooking-vessels made to fit into it. Whereas in the ordinary way of cooking, the fire is necessarily kept up during the whole of the time required for completing the cooking process; the same result is obtained, in using this apparatus, by simply giving the food a start of a few minutes' boiling, the rest of the cooking being completed by itself in the heat-retainer away from the fire altogether.

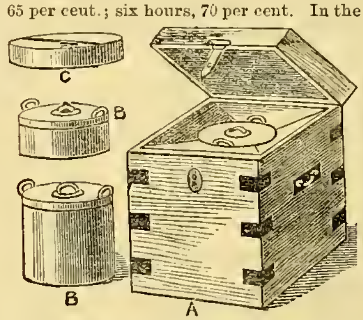
"*Directions for Use.*—Put the food intended for cooking with the water or other fluid, *cold*, into the saucepan, and place it on the fire. Make it boil, and when on the point of boiling, skim if required. This done, replace the lid of the saucepan firmly, and let it continue boiling for a few minutes. After the expiration of these few minutes, take the saucepan off the fire, and place it immediately into the isolating apparatus, cover it carefully with the cushion, and fasten the lid of the apparatus firmly down. In this state the cooking process will complete itself without fail.

"*By no means let the apparatus be opened during the time required for cooking the food.*

"The length of time which the different dishes should remain in the isolating apparatus varies according to their nature. It may, however, be taken as a general rule that the same time is required to complete the cooking in the apparatus as in the ordinary way on a slow fire.

"The advantages of this apparatus are thus detailed by Herr Sorensen, the patentee, whose attention was first directed to the subject by the Norwegian peasants, who heat their food in the morning, and whilst away in the fields keep the saucepan hot by surrounding it with chopped hay.

"1. *Economy of Fuel* varies according to the length of time required for cooking the different sorts of food. For those requiring, in the ordinary way, only one hour's cooking, the saving is about 40 per cent.; two hours, 60 per cent.; three hours, 65 per cent.; six hours, 70 per cent. In the



THE NORWEGIAN SELF-ACTING COOKING APPARATUS.

A, the box, lined with felt; B, B, saucepans fitting into box; C, the felt cover to be placed on the top of the saucepan.

case of gas being used, the saving would be greater still.

"2. *Economy of Labour.*—A few minutes' boiling is sufficient. No fire is necessary afterwards. The cooking-pot once in the apparatus, the cooking will complete itself. Over-cooking is simply impossible, and the process of cooking is infallible in its results. The food will be cooked in about the same time as if fire had been continuously used But the food need not be eaten for many hours after the cooking process is complete; so that half-an-hour's use of a fire on a Saturday night, for example, will give a smoking-hot dinner on Sunday.

"3. *Portability.*—The weight of the apparatus, complete, varies from eighteen to fifty pounds. The apparatus can, in proportion to its dimensions, be carried about with great facility, without interfering with the cooking process. By means of a large apparatus, for instance, following on a cart a detachment of soldiers on the march, it is possible to provide them with a hot meal at any moment it might be found convenient, as may be proved by official reports from the officers of the Royal Guard at Stockholm, in the possession of the patentee.

"Again, fishermen, pilots, and others, whose small vessels are not generally so constructed as to enable them to procure hot food while at sea, may easily do so, by taking out with them in the morning an apparatus prepared before their departure. It is, in short, a thing for the million, for rich and poor; for the domestic kitchen, as well as for persons away from their homes. It cooks and keeps food hot, just as well as when carried about on a pack-saddle, on a cart, or in a fisherman's boat, as in a coal-pit or under the kitchen table.

"4. *Quality and Quantity of the Food prepared.*—Where other plans of cooking waste one pound of meat, this apparatus, properly used, wastes about an ounce. The unanimous testimony of those who have used it pronounces the flavour of food cooked in this manner incomparably superior to that which is ordinarily produced.

"5. *Simplicity of Use.*—One of the greatest advantages of this invention is, no doubt, its simplicity and practical application. There is no complication of hot-water or air pipes to retain the heat, no mechanical combination whatever for producing a high degree of heat by steam-pressure; consequently there is no necessity for steam-valves, or other combinations which would render the use of the apparatus difficult and dangerous. Any person will, without difficulty, be able to use the apparatus to advantage after once having witnessed it in operation. No special arrangement is required in the kitchen for using the apparatus. Any fuel will do for starting the cooking.

"6. In addition to all these advantages, the complete apparatus constitutes the 'Simple Refrigerator,' for the preservation of ice, which has attracted so much notice (see letters in *Times*, July 30th, 31st, August 4th, 1868), and had such warm approval from medical men. 'It will keep ice in small quantities for many days.'

"The author of the above says:—'One of the most interesting novelties displayed in the department devoted to Norway, in the French Exhibition of 1867, was the Self-Acting Norwegian Cooking Apparatus, constructed in the most simple manner, of a wooden box lined with four inches of felt, in which the saucepans containing the food, previously boiled and maintained at the boiling-point for five or ten minutes, according to the nature of the food to be cooked, are placed. The heated saucepans are covered with a thick felt cover, and, the lid of the box being fastened down, the rest of the cooking is done by slow digestion, no more heat being added.

"The heated vessels containing the food will retain a high temperature for several hours, so that a dinner put into the apparatus at 8 o'clock in the morning, would be quite hot and ready by 5 o'clock in the afternoon, and would keep hot up to 10 or 12 o'clock at night, because the felt clothing so completely prevents the escape of the heat; and as the whole is enclosed in a box, there are no currents of air to carry off any other heat by convection."

Removal of Ink Stains from Ivory.

C. J. M. (*London*) suggests that H. A. D. (*Belfast*) should use chloride of lime made into a paste.

Liquid Damp-Proof Glue.

CHEMICUS writes:—J. B. (*Jubbulpore*) will find the following very good. Mix 4 parts of treacle with 12 parts of water—by weight, and add 1 part of quicklime; heat to about 150 degrees Fahr., and afterwards macerate for 2 or 3 days with frequent agitation. Then decant from the undissolved lime. The solution has the consistence of mucilage. By adding to this solution about a quarter its weight of glue with about 2 or 3 per cent. of glycerine, a strong and waterproof glue will be formed

Small Portable Forge.

AMIGO sends the following reply to T. W. (*Clapham*):—The accompanying sketches will convey some idea of small forge with fan attached. H is the hearth; T a trough extending across, for holding water; F is a grooved fly-wheel, worked by the crank C, connected to pedal P, by a rod with eye at D to hook on pedal. The pedal rocks on a bar fixed to legs at back. A is the fan driven by cord from flywheel to small pulley on fan spindle, as shown in ticked lines. The flywheel is carried on a stud, or pin, passing through the cross straps shown in end at back of hearth. The fan is secured to a plate fastened to the legs. The flywheel is 18 inches in diameter, and the fan 8 inches, with four arms and vanes, each 2 inches by 2 inches, and the small pulley being 2 inches in diameter, will easily run at 1000 revolutions per minute. The hearth may be made of $\frac{1}{16}$ sheet iron riveted to the legs, which may be of angle iron 1½ inch by 1½ by $\frac{3}{16}$ inch. E is the pipe leading blast to the iron. I hope the above will assist T. W. If it is not sufficiently comprehensive, I shall be happy to furnish any further information within my power. The illustrations are drawn on the scale of 1 inch to a foot.

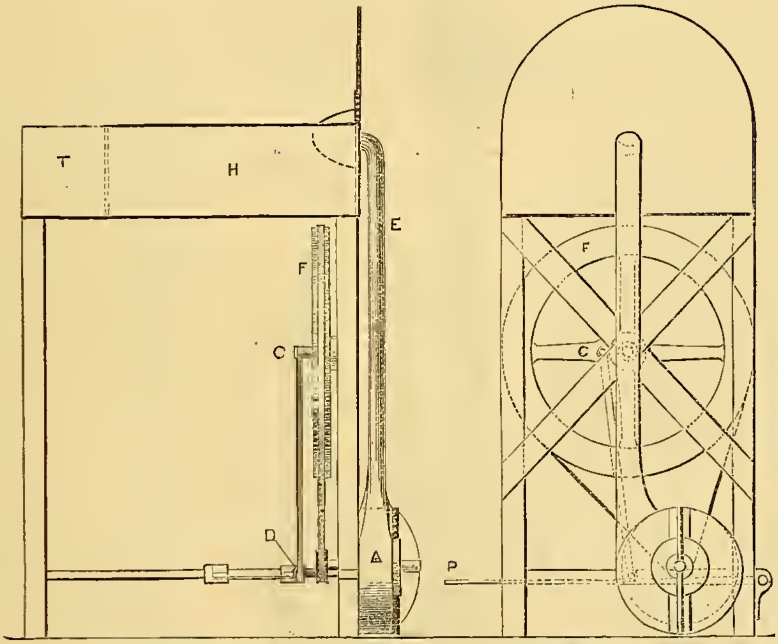


Fig. 1.—Front Elevation. Fig 2.—End Elevation at Back of Fire.

SMALL PORTABLE FORGE.

Ink for Rubber Stamps.

CHEMICUS writes in reply to J. B. (*Jubbulpore*):—The following simple formula has yielded very satisfactory results: Solid aniline dye (black, scarlet, or blue), ¼ oz., boiling water, 2½ oz., glycerine, ½ oz., treacle, ¼ oz. Dissolve the dye in the boiling water, then add other ingredients. When cold it is ready for use. The cost of 3 ounces of the above ink will be less than sixpence.

Gas-Black as Ebony Stain.

J. E. L. (*Oldham*) writes in reply to C. (*Islington*):—Gas-Black cannot be used exactly as a "stain," but will make a very good black enamel. Mix sufficient finely powdered and sieved gas-black with *wood naphtha*, to make the mixture of the consistency of cream, add sufficient shellac to make it stick, but not enough to give a glossy appearance if a dead-black is required.

Varnish for Paste Board.

CHEMICUS writes in answer to S. H. (*Derby*).—I send the following recipe. An excellent varnish which dries in a few seconds, and produces a colourless, smooth, and shining enamel, is prepared from the following ingredients: Sandarac, 53 parts; mastic, 20 parts; camphor, 1 part; oil of lavender, 8 parts; Venice turpentine, 4 parts; ether, 6 parts; methylated spirit, 40 parts. The ingredients must be maccrated for weeks, until everything is dissolved.

Circular Mouldings.

E. W. (*Headley*) will perhaps find the following to answer as well as the tool he enquires about. No special tools are required, and with a little pains and

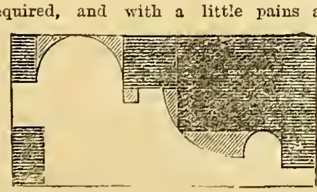


Fig. 1.

patience an excellent job can be made. The tools needed are a few chisels and gouges various sizes, a brogue, an ordinary gauge, and a few small blocks of hardwood to fix the brogue in when using

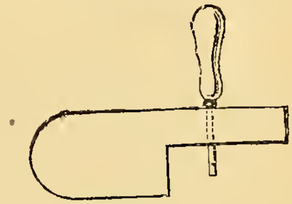


Fig. 2.

it as a cutter. Whether the moulding be an outside or an inside curve, or whether the curve be round or oval, or a combination, the method is essentially the same. Commence by gauging and planing your wood up nearly the finished size, then chalk the ends and draw the moulding with a hard sharp pencil, as in Fig. 1. Gauge the pieces shown in dark shading and cut them away carefully with chisels and gouges. The grooves are cut by using the brogue in the manner shown in Fig. 2. When all the grooving and checking has been done you may proceed to finish it carefully with chisels and gouges, and afterwards little pieces of cork and sandpaper. When working in cross-grained hardwood I have found it best to rub my chisels and gouges sideways on the set-stone so as to make them scrape rather than cut.

Effect of Zinc on Hot Coals.

J. E. L. (*Oldham*) writes in reply to H. B.:—I have frequently noticed, when emptying into the stove fire, the refuse oxidised matter from a ladle, in which zinc has been melted, that every vestige of soot disappears, as if by magic, from the inside of the stove, and as far up the pipe as can be seen. The refuse burns with beautiful colours, and gives out thick white fumes, which deposit on cold surfaces exposed to them.

Rebrowning Gun Barrels.

GRAHAM writes for the information of C. J. M.:—Some time since I was away shooting; among my guns was one with bright barrels. I wished to brown them, but could not get any mixture for the purpose nearer than forty miles; I therefore varnished them with Ibbotson's Oak Stain (Dark)

and what was put on a makeshift has remained ever since. If I had taken a little more care in putting it on, it would look better but not be more useful.

Polishing Horn.

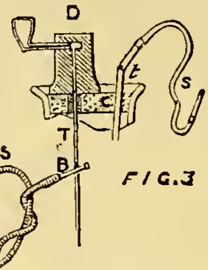
Willing to Help sends the following to E. B. to polish horn:—Get some pieces of glass and scrape the horns all over thoroughly; then take some fine sand-paper, and give a good rubbing. If any ridges appear, as they will do if not most carefully scraped, give them a touch with the glass. Then take a slightly greasy woollen rag, a little dry whiting, and a good supply of elbow grease, and rub again and again until you are satisfied with the polish, when the horns will be finished. It will be found that the cutting edges of the glass require constant renewal. This is done as follows: Take a file, and press it with the chest against anything that will hold it firmly. Take a piece of glass in both hands, turn the glass away from you, and run it lightly, but sharply, down the edge of the file, reverse the glass on the file so as to bring the top towards you, pull down hard with both hands. It will come asunder, and give fresh cutting edges.

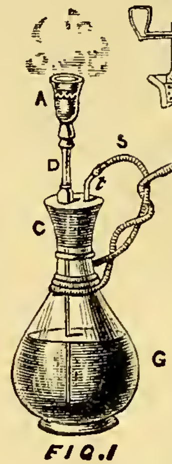
Dead Polish on Wood.

Iago Cybi sends the following reply to Chips:—For dead polish on wood take bees' wax, 1 lb., resin, 2 ozs., and dissolve in turpentine; then take half ounce of benzoin, dissolve in half-pint methylated spirits, and mix the whole together. For the stain, dissolve asphalte in turpentine, according to shade required. This is very useful when repairing old furniture, for staining the new parts to match the old. The polish will not mix well together, but when about to use it, shake the bottle well. I have used it myself, and so can recommend it. This recipe is valuable, and the only polish approved of by the late Sir Gilbert Scott, and was used in all the churches restored by him.

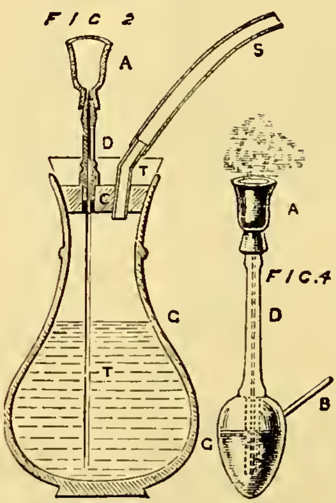
Hookah.

L. M. T. D. (*Glasgow*) sends the following information, and the accompanying sketches for A. W. (*Leeds*):—Fig. 1 shows hookah complete. A is a special meerschaum bowl. D is a turned piece of wood to fit bowl, and left long enough to go into cork C. C a good, sound, tight-fitting cork. T a glass tube about ½ inch diameter, fitted into bottom of D, and of such a length as to be about 1½ inch above bottom of water-bottle, vase, etc., G. T a small piece of tube (glass) ¼ inch diameter, put through cork, and projecting about ¼ inch under cork. S is the "snake" or tube (india-rubber $\frac{5}{16}$ths or ⅜ inch diameter) attached to T. B the mouthpiece. Water in bottle should always be about 3 inches below end of tube T; and should be renewed frequently as it soon gets discoloured. Fig. 2 is a section of Fig. 1. Fig. 3 shows pillar D adapted to an ordinary pipe, the mouthpiece being unscrewed, the bowl may be screwed on to face of pillar, instead of inserting whole stem of pipe, as sketched. Fig. 4 shows the hookah, as commonly used in India. A, burnt clay bowl. D, turned wooden pillar. C, cocoa-nut shell. B, bamboo mouthpiece. Water, of course, below entrance to mouthpiece. The letters refer to same parts in all the sketches. If the cork can be got sound, and of sufficient length, I would advise A. W. to keep it





HOOKAH.
Fig. 1. Hookah complete; Fig. 2. Hookah in section; Fig. 3. Adaptation of pillar to ordinary pipe; Fig. 4. Indian hookah.



projecting above neck of bottle, as shown by dotted line in Fig. 2. If air gets into vessel, and smoke does not come through tube in sufficient quantity, the top of the cork must be varnished, or have a coat of india-rubber varnish.

INFORMATION SOUGHT.

Impressions of Ferns, etc.

R. C. writes:—Can anyone inform me how I can take impressions of ferns, leaves, etc., on paper, and whether special paper is required or not?

Vane.

H. S. (*Hackney*) writes:—I should be obliged if you, or one of your readers, would give me directions how to make a vane, with one of those figures that swing their arms about. Is there any other way but the usual (arrow) system of keeping them to the wind?

Amateur's Cheap Lathes.

Conscientious Turner wishes to know if he can purchase anywhere a better or cheaper amateur's lathe than that sold by Messrs. Selig & Sonnenthal, *Queen Victoria Street, E.C.*, called the "Victoria," price £17 10s. [I am not acquainted with the "Victoria" Lathe, and therefore I cannot venture to express any opinion on it at the present moment, but I may say that excellent lathes may be obtained at lower prices from various makers. At the same time the requirements of the person who is to use the lathe must be borne in mind. A cheap lathe that would suit a beginner would not be suitable for a turner who was gaining experience in the art, and who would require a more expensive one. Will any correspondent report on the "Victoria" Lathe?—Ed].

BRIEF ANSWERS TO MINOR QUERIES.

V. (*Ambleside*).—If you like to write a paper on the subject you name in your letter, and send it to me, it shall receive careful consideration. Papers on Gilding will appear in Vol. III., commencing with Part XXIV. for November, 1883.—Alpha. You will find the article you ask for in this Part. —W. P. (*Withington*) I am glad to hear you have been successful in removing the paint. I cannot possibly take upon myself to say whether or not you are competent to write upon the subjects you mention in your letter. The only course for you to adopt is to prepare an article and submit it for consideration.—Iago Cybi. 1. Send the working drawings of the machine you mention, accompanied by a description of the method to be followed in making it. 2. The rate of issue will not be increased at present, if at all. 3. I will bear in mind your request with regard to tool-making.—A. T. A. Papers on the subject you mention will be given eventually, but owing to the mass of matter with which I have to deal, I can name no definite time at present.—Subscriber. For instructions in pruning trees and shrubs, see "Beeton's Garden Management," published by Messrs. Ward, Lock, and Co., at 7s. 6d. In making a fresh strawberry bed use rooted runners only. I cannot tell you a cheaper way of making sherbet than that which you have in the work you mention.—J. M. H. No queries of the kind you propose are answered in this Magazine.—C. J. C. The paper you ask for on building a brougham would be useless to amateurs in general, and I must devote my space to articles on subjects that are useful to the many.—B. G. W. A paper on the subject you mention is in preparation, but has not yet reached my hands.

Jack Horner.—I am sorry you should have taken the trouble to write about so trifling a matter. It was necessary for me to take advantage of your previous strictures to put things in a proper light before the readers of the Magazine.

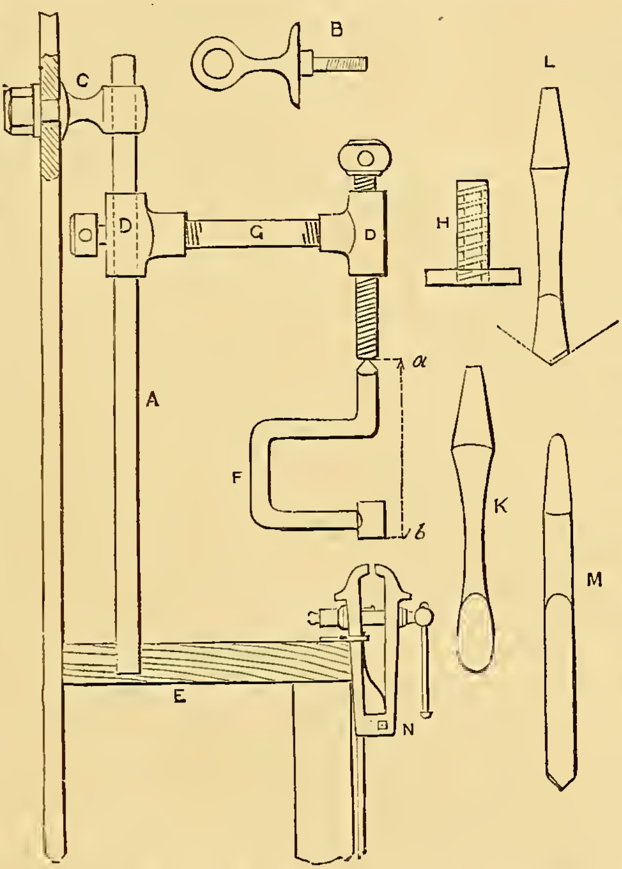
Communications received and unavoidably held over.—A Poor Man, J. Sandwell, W. J. S. (*Chelsea*), Haroer Brothers, G. P. (*Gateshead*), Anxious, A. F. S. (*Dresden*), J. W. C. (*Henwick*), H. C. S., Victor, H. S., E. C. D., G. F. (*Hereford*), J. S. (*Lockerbie*), F. J. W., J. H. R. (*Middleton*), Desirous, Not too Old to Learn.

A FEW HANDY TOOLS, AND HOW TO MAKE THEM.

By JAMES LUKIN.

IT is astonishing how few amateur workshops contain efficient drilling and screwing apparatus; yet of all mechanical operations these are the most generally needed where metal work is carried on. Drilling is very generally relegated to the lathe, which, though a very fit and proper machine to carry small drills, is, at best, but a poor contrivance for the purpose, owing to the difficulty of holding, in a satisfactory manner, the work to be operated upon. As long as the latter is of such size and shape that it can be held by the fingers, and subjected to pressure by means of the back poppit screw, drilling in the lathe is quite the best and simplest method, now that self-centring drill chucks are so readily obtained. But, very frequently, some more efficient mode of securing the work is needed; and if, in addition, it is of such form that it is found advantageous to place it on a bench or in a vice, and drill it when in that position, some kind of upright or vertical drilling apparatus then becomes highly desirable. Now, to take up, say Churchill's Catalogue, is to make an amateur's mouth water. Therefore put it aside, and let us see what can be managed in the home workshop, by help of a little ingenuity and patience. We will first of all arrange a simple pressure frame for use with an ordinary hand-brace, which latter, I may remark, is a tool of real use, and far too much neglected by amateurs on account of its apparent clumsiness. The practical mechanic, on the other hand, would make it one of his first purchases. The village blacksmith, I may state, is often a far less clumsy hand than is commonly supposed, and will make a brace for much less than is charged at a tool shop. The pressure frame consists of an upright bar, from which projects a horizontal arm adjustable for height, and through a boss at the end of this arm passes a screw to act upon the upper end of the brace.

How much of this can we hunt up among the odds and ends of the workshop, or obtain for a shilling or two at the nearest ironmonger's, or old iron store? In these days when gas is used, even in the small provincial towns, gas pipes of iron, and T-pieces, and sockets tapped and screwed are always to be had; and, if you look at any scrap heap of a foundry, or marine store, you may see many a length of gas pipe available for tool handle ferules, or for the object now under consideration. Even when new, these articles are very cheap.



A HANDY HOME-MADE DRILLING APPARATUS FOR AMATEURS.

A, Vertical Bar; B, Socket to hold Bar (Plan); C, Socket in elevation; D, D, Sliding Socket on Bar, with Screw to hold Brace; G, Pipe connecting Sockets D, D; E, Bench; F, Iron Brace; H, Plug with Flange; K, L, M, Drills; N, Vice.

I have no catalogue by me of very recent date, but the T-pieces are priced in the list of a large manufacturing chemist as follows: 1s. 6d. with bore 1 inch diameter; 1s. 2d. with $\frac{3}{4}$ inch bore; 9d., $\frac{1}{2}$ inch. The pipe is 5d. to 7d. per foot for the same sizes. The sockets are T-shaped, L-shaped, straight, with both ends similar, and also of the same shape, but with one end larger than the other. These are called diminishing sockets. I fancy the price here stated is higher than that asked at the ironmonger's. The same kinds of sockets are also made in brass.

I purposely digress upon this subject because we shall need one or two such T-pieces, and because many of these gas-fittings come in exceedingly well for other purposes, and can often be used as substitutes for castings. I propose to make such use of them for the work in hand. For the upright bar a bit of 1 inch gas pipe will serve very well, and it may be

from 2 feet to 3 feet long. Perhaps 2 feet 6 inches will serve; but, as the whole affair is to be fixed over the vice bench, and the lower end will rest on the bench while the jaws of the leg vice stand up 3 or 4 inches above it, a 3-foot length will be better. The size being 1 inch *bore* will afford a good strong bar, its outside being $1\frac{1}{4}$ inch or more. The cost of this will be, therefore, not more than 1s. 9d. We now require a T-piece which will slide easily, but without much play upon it. We can mount the 1 inch bore T-piece in the lathe, and bore it so as just to cut out the screw threads, when it will be exactly what is needed; and as these gas threads are very shallow, sufficient metal will still remain to prevent the socket from bursting out when under the strain that will come upon it. But if we have any doubt about this, we can substitute a T-piece a size larger and leave the threads, as this will slide up and down without being bored out at all. In this case (and it is always well to err upon the side of strength) I should advise a T-piece with both ends alike, but with the stem of the T-piece a size smaller, *i.e.*, of 1 inch bore; the main socket being $1\frac{1}{4}$ inch. Into this, at the back there will have to be tapped a binding screw, by which to clamp it at any desired part of the upright bar (pipe). This ought to present no difficulty to an amateur, as he can do but little indeed if he cannot drill and tap a hole, and fit a screw into it. We now require a bit of 1 inch (bore) pipe for the horizontal arm. The length of this will depend on how far from the wall the vice chaps are, but the shorter it is the better, so long as it will prevent the knuckles, when the brace is being used, coming in contact with the upright bar. Eight inches should therefore suffice. One end of this being already cut with a screw will be firmly screwed into the diminishing socket of the T-piece, which slides on the upright pipe, and will stand at right angles, therefore, to the latter. I am not quite sure, but I believe you can obtain pieces of pipe screwed at both ends of almost any length, *i.e.*, short pipes as well as long ones. If you can get, therefore, a bit of pipe, 7, 8, or 9 inches long, with screws at both ends, do so, but if not, you must do your best to cut a screw (or get it done at the gas-fitters). This screw is for the attachment of another 1 inch T-piece, and it is to fit the stem of the T so that it shall stand perpendicular to the arm, and vertically. The drawing will make all this clear. Now the pressure screw has to be fitted to work inside the last T-piece, but the size of the bore is too big, and if it were not, the thread is only cut about $\frac{1}{2}$ inch inside both ends of the piece. It is necessary, therefore, to plug the part with an iron or brass plug, of which a nut can be made by boring and tapping. It will be necessary, therefore, to consider what will be likely to prove the easiest. If, however, the amateur can himself turn and make the pressure screw, he can make and fit a plug and tap it. It will not, I think, prove a very difficult job. Of course, this end piece and the arm, as well as the upright pedestal, can be of solid bar if preferred. A blacksmith will readily forge the lot; but in any case the screw and its nut have to be made; and so convenient are these gas-tube fittings, that it is a pity not to use them if they can be had. The length of the brace between *a* and *b* is often uselessly prolonged. If the arm and hand can readily enter the cranked part, that is all that is needed, but the drill socket should be long enough to prevent the squared end of the drills projecting so as to endanger the arm during use. The cranked brace is often itself supplied with a pressure screw. This gives more vertical range, but complicates the tool unnecessarily, as the top feed supplied by the pressure screw of the horizontal arm will suffice for all amateurs' work. The ring and screw B, to support the upper end of the pedestal, is shown as intended to pass through the wall, but may be made with merely a flat plate drilled for four stout screws. The tendency is not to displace it, but merely to force it back against the wall. The lower end of the pedestal is let into the vice bench as shown, or is welded or riveted into a flat plate to attach to the vice-bench with screws. Either will do, but if gas-pipe is used, as specially intended in this article, the simplest way is to let it into the bench as drawn here.

One of the main objects of this article is to show the handiness of gas-pipe for workshop fittings. It is cheaper than solid bar, and quite stiff enough for many such purposes as the above; and when the ends are needed to be solid, they are easily plugged with steel, iron, or brass. In the present case, as the pressure on such plug will be directly upwards, it should be made with a flange at the lower end, like H. This plug need not then be made very tight, as it can be held by a couple of short pins or screws. The arm G should be just long enough to bring the drill over the vice, N. When the vice is not used, G is of course swung round so as to be over the bench itself. Five or six shillings will, I think, quite suffice to fit up this drill-post complete.

While speaking of the apparatus in question, it may be as well to add a few words about the drills. The amateur who possesses that most useful appliance, a portable forge, will have no difficulty, after a little practice, in making his own drills; and if he has no forge but a fireplace in which he can fit a blower (I mean merely a sheet of iron to draw up the fire), he may, with a little contrivance, do the same. Steel must not be heated to anything like a white heat, and therefore a forge is not in this case a matter of necessity. But an anvil or some heavy block of iron of

rectangular shape must be found upon which to lay the steel when heated, and also a pair of smith's tongs and a heavy hand-hammer. Very great heat can be got out of an ordinary fireplace by means of one of the above blowers if it is made to come down to the bottom bar. In many cases brass can be melted, and small jobs of brazing done, but for the latter an open forge fire is far preferable on account of the difficulty of getting work placed properly in an ordinary grate. For small forging, however, where a bit of iron can be put in between the bars, no such difficulty exists. Blacksmiths use old files for drills; but for anything like nice work, it is far better to get a few square bars of good steel, which can be easily and accurately fitted to the taper-hole in the brace. This can be done wholly by filing, though it saves the file to heat and hammer the steel to something near the required taper. This is the first thing to be done, and the next is to heat and draw down the bar to the required size, and then to spread the end. The forging will be like K; the finished drill like L. The end is to be square, as shown by the dotted lines, unless some special job should need a more acute point. Very small drills are often pointed, but for work needing a cranked brace the square end is correct. Of course the sides—the flats—are bevelled downwards to thin the lower edge, and then, when the end is squared off, as shown, the two cutting edges are bevelled off to complete the tool. And here again a great mistake is made. These edges are bevelled off a great deal too high. They should merely escape rubbing. It does not add to their sharpness to make them of a long bevel, and they are exactly the same in principle as a cutting tool for the lathe. Looking at the drill edgewise, K is no sharper than L, but is simply weaker. There is also no need to spread the metal, by hammering, wider than is absolutely necessary. It should be just enough spread to let the shank enter nicely without rubbing. The best shaped drills are made of round iron, like M, the metal being very slightly spread at the point, and the main shank running parallel for some distance, but the older form will answer very well for general work; and if anything better is needed, there are the twist drills, sold in sets with squared heads on purpose for use with the hand-brace. To watch the latter as commonly made and used, the wonder is that a hole can be made with sufficient accuracy for even the most unimportant job, so eccentric are the gyrations of the tool, but if nicely made and used with twist drills, very excellent work can be done. It is also a powerful tool, and will save a great deal of wear and tear of the lathe. When the latter is used, twist drills are by far preferable to others, not only because they are so easily fitted to the self-centring chucks sold for the purpose, but because they cut so freely as to need but very slight force to keep them up to their work. They therefore do not strain the mandrel, or bring undue pressure upon the tail-pin behind it. For use with the brace these drills are equally satisfactory, but for some reason—prejudice and custom, probably—it is seldom, if ever, they are met with now in the workshops of country blacksmiths, nor even generally amongst fitters.

HOW TO MAKE A MAGNETO-ELECTRIC MACHINE.

By GEORGE EDWINSON.

WHEN I drew up my plan for the treatment of electric machines, I intended to have embodied a description of magneto-electric machines, in a series of articles dealing in detail with those dynamo-electric machines and electro-motors, the construction of which might reasonably be supposed to be within the means and ability of amateur workmen. In devoting a single article to the description of a magneto-electric machine I shall deviate but little from my original plan, for, in that I intended to have led my readers from the construction of a simple useful machine up to the details of more complicated and larger machines, and I can think of no better beginning than the attempt to make such a machine as that detailed in this article and the sketches accompanying it. There is but little difference in principle between any of the forms of machines used in the generation of galvanic electricity, since all depend upon the movements of magnets in front of or close to their armatures, or, conversely, the movement of armatures in front of magnets, to generate an electric current. When permanent magnets are used in their construction the machines are termed magneto-electric machines; when electro-magnets or their armatures are made to move in each other's vicinity, and so create electric currents, the machines are termed dynamo-electric machines, because for distinction the current is supposed to be generated by the motive power imparted to the machine. But, as a matter of fact, there are few machines made that could be strictly named dynamo-electric machines, if indeed there are any that will merit the definition, since all depend on moving masses of iron, or movements of coils of wire in the presence of masses of iron, for their usefulness, and it is well known that iron always holds some traces of residual magnetism. Without stopping to quote how or by whom the property was discovered and applied, I will say at once that it is well known, that when a piece of iron is made to move within the influence of a magnet, the magnet makes, as it were,

a snatch at the iron as it passes to and fro, and if the piece of iron has been wound with insulated copper wire, it is known that an electrical impulse is sent through the wire at every snatch of the magnet. The force of this impulse is regulated by the strength of the magnet, and the number of convolutions of wire brought within its influence, together with the rapidity of motion given to the iron, which is here named the armature. This property of magnetism to cause a current of electricity in a coil of wire, is termed its "inductive influence," and the current of electricity thus caused, is termed an induced current. All currents of electricity possess this property, and exert an inductive influence on all conducting bodies contiguous to those which convey the currents.

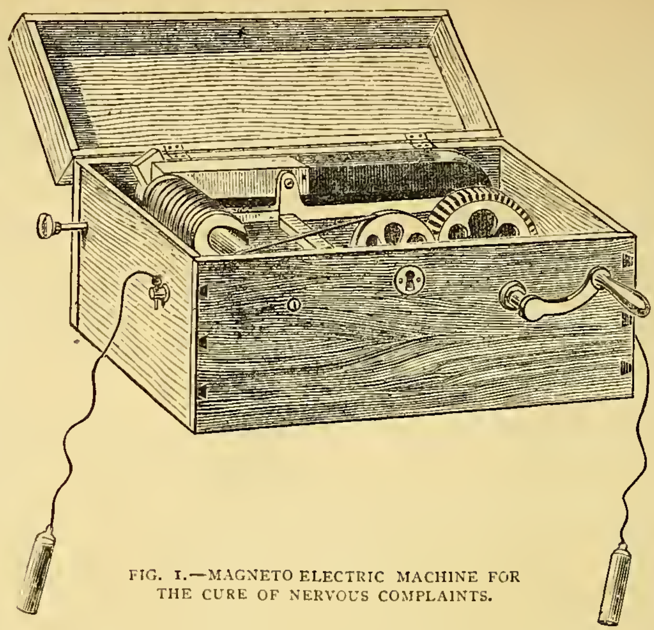
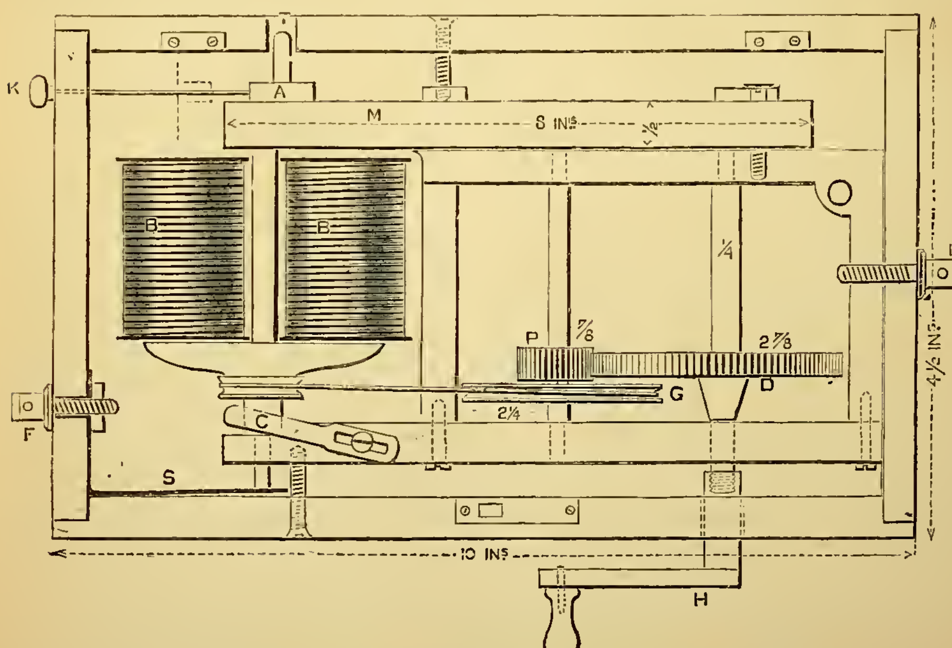


FIG. 1.—MAGNETO ELECTRIC MACHINE FOR THE CURE OF NERVOUS COMPLAINTS.

We cannot stay now to inquire into the causes of induced currents, the laws which govern them, nor their general characteristics; suffice it to say that the well-known property of magnets to induce a current of electricity in a coil of wire wound on an armature moved within their influence, has been utilized in generating currents of sufficient intensity to flash through the muscles and nerves of human beings, and cause those peculiar sensations known as shocks. The magneto-electric machine now before us is therefore simply a shocking machine, and its use is to send a series of electrical tremors through the body in such a manner as to relieve pain, and assist in curing disease.

The most simple form of such a machine is shown at Fig. 1, where the machine is represented as enclosed in a mahogany box, fitted with lock and key; and at Fig. 2, which is a plan of the same, exhibiting



REFERENCES TO LETTERS IN FIG. 2.

A, Armature.
B, Bobbins.
C, Contact Break.
D, Driving Wheel.
E, F, Studs to connect Shocking Handles.
G, Grooved Wheel.
H, Driving Handle.
K, Armature Knob.
M, Magnet.
S, Spring connecting F with spindle of coils.

FIG. 2.—PLAN OF MAGNETO-ELECTRIC MACHINE IN BOX, SHOWING ALL ITS PARTS IN THEIR RELATIVE POSITIONS.

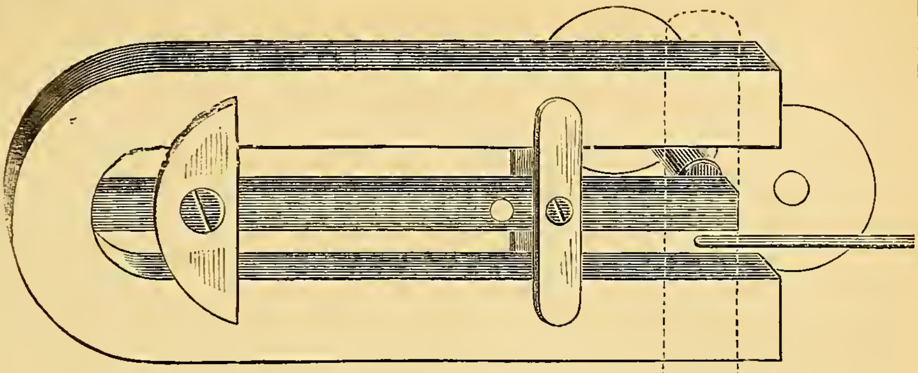


FIG. 7.—BACK OF MAGNET, SHOWING METHOD OF FASTENING IT TO FRAME, AND POSITION OF ARMATURE, BOBBINS, ETC. Dotted lines show position of armature.

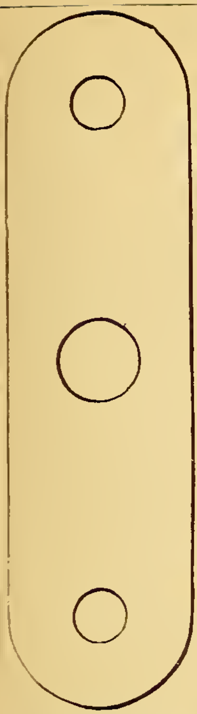


FIG. 8.—FORM OF WROUGHT-IRON CORE-HOLDER.

FIG. 5.—END OF CONTACT SPINDLE.

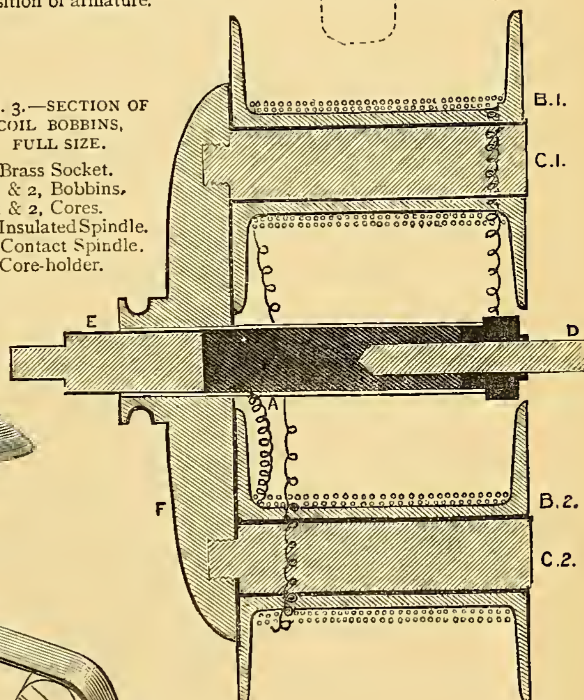


FIG. 3.—SECTION OF COIL BOBBINS, FULL SIZE.

A, Brass Socket.
B 1 & 2, Bobbins.
C 1 & 2, Cores.
D, Insulated Spindle.
E, Contact Spindle.
F, Core-holder.

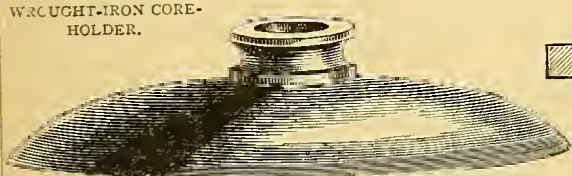


FIG. 4.—CORE-HOLDER. FULL SIZE.

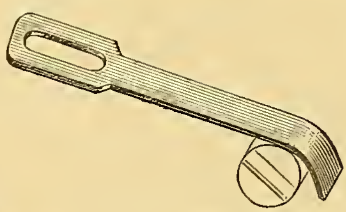


FIG. 6.—CONTACT SPRING OF BREAK.

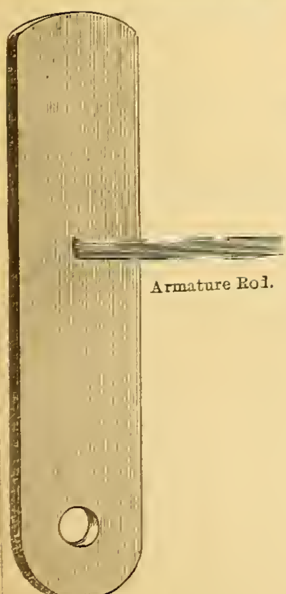


FIG. 9.—ARMATURE AND ROD.

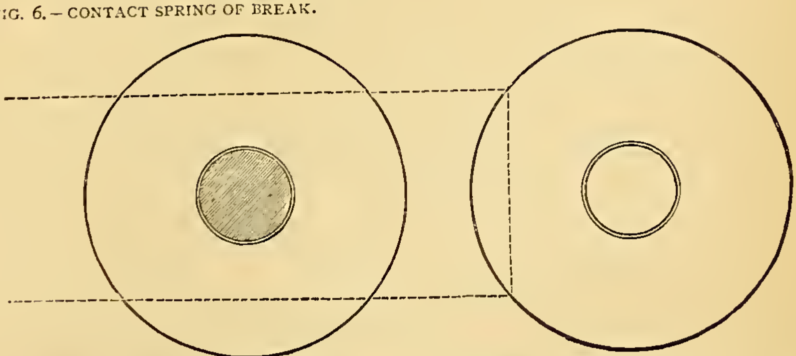


FIG. 10.—RELATIVE SIZE OF COIL BOBBINS AND THEIR CORES TO THE MAGNET. FULL SIZE.

its construction and arrangement. The machine itself consists of a permanent magnet M, 8 inches long, with legs 1 inch wide by $\frac{1}{2}$ inch thick; the price of such a magnet will be from 6s. to 6s. 6d., and is best when bought of makers or vendors, for an amateur cannot easily make one; nor can he get such good results from a home-made magnet. The next most important parts are the two bobbins, B B, shown in section and in detail at Figs. 3, 4, 5, and 6. These are made up of the core-holder (Fig. 4), and F in section (Fig. 3); the cores, C 1 and C 2; the bobbins, B 1 and B 2; the contact spindle, E, the insulated spindle, D, and a piece of brass tube, A. The core-holder is shown full size: it may be of cast iron, cast and turned to the form shown, or it may be made out of a piece of wrought iron of the form shown Fig. 8; in this case a driving pulley will have to be fitted on the contact spindle, and this firmly fixed in the core-holder. The cores are made out of best round iron $\frac{7}{16}$ inch in diameter, turned and screwed at one end and fitted into the core-holder, as shown. On these cores are fitted two bobbins of turned iron, $1\frac{3}{8}$ inch in diameter, with the outer faces filed or planed true with the ends of the cores; the inside parts of the flanges, and the bodies of the bobbins should be well covered with melted shellac, and then filled with No. 34 or 36 silk-covered copper wire regularly wound on. To do this, mount the bobbins inside end to inside end on a mandrel, or on a spindle secured in a lathe; small holes should have been bored near the edges of the inside flanges, and a small groove cut with the file for each of the flanges from the holes down to the body of each bobbin. The hole is to take the starting end of the wire, and the groove is to receive the wire; therefore pass 6 inches of the wire through one of the holes, secure it there with a drop of sealing-wax, lay the wire along the groove, then secure this also with a streak of sealing-wax; hold the wood bobbin (on which the wire is wound) on a piece of iron wire held in one hand, at the distance of 7 or 8 inches from the metal bobbin; start the lathe, and allow the wire to guide the hand to and fro instead of attempting to make the hand guide the wire. Work slowly and guide it on well, and when the first bobbin is full to within $\frac{1}{8}$ of an inch, fasten off the wire at one side with a bit of sealing-wax; cut off the wire, leaving 6 inches as at starting, and proceed to fill the other bobbin in the same way When the bobbins are fitted on their cores, it will be seen that the wires from the inside ends will be similarly placed as those on the legs of an electric bell magnet; these two ends must be soldered together when the bobbins are in position on their cores. There now remains the other two ends to be disposed of. One of the ends must be stripped of its silk and soldered to the brass tube A, the other end must be stripped in a similar manner, passed through a hole in the ebonite plug at the other end of this tube, and soldered to the insulated spindle D.

This tube, with its projecting spindles must now be described. It will be noticed that the core-holder F is bored through with a hole $\frac{3}{8}$ inch in diameter. This hole must be tapped to receive the screwed end of a piece of brass tube, length $1\frac{5}{8}$ inch, fitted tightly with a steel spindle E; this is the contact spindle, the end of this spindle is shown in elevation at Fig. 5, representing the form to which this end must be filed and turned. Having fitted the contact spindle into the tube, the remaining part of it should be filled up with a closely-fitting plug of wood, or of ebonite. If the body of the tube has been filled up with a wooden plug, it will be best to fit an ebonite extension to the tube, as shown by the deeply-shaded part in the sketch. A hole must now be bored through the ebonite and into the plug to receive the end of the spindle D; this must be done with great nicety and exactly in line with the contact spindle, for if the centre of the two spindles are not exactly in line with each other an eccentric or wobbly motion will be given to the bobbins. It will now be seen that this spindle is insulated from all other parts by the ebonite and the wood. We must now bore a small slanting hole through the ebonite plug, bring one outer end of the wire from one of the bobbins through this hole; bare the end of the wire, clean this and the spindle with a scrap of emery cloth, wind the bare end of the copper wire around the spindle two or three turns, and put on a drop of solder to secure it in contact. A strip of velvet passed around both coils and sewn between them will impart a finished appearance.

Before we pass on, let us note that, if the wires from a galvanic battery were connected to the spindles D and E respectively, the electric current must travel through all the wire on both bobbins, and also that any current set up in those wires must be taken off at D and E. When the bobbins are fixed in position in the frame and we turn them in front of the magnet, this makes snatches at the bobbins and their cores, and causes a current of electricity to pass through the copper wire wound upon them. If now we allow the spindles to run in a metal frame, the current of electricity will circulate through that frame outside the bobbins; but if we insulate one of the spindles from the frame by a bush of ebonite or of wood, we shall not get an external circuit for the electric current. As we do not desire to waste the current in a useless round through the frame, we bore a large hole in the frame for the end of the contact spindle; bush this hole with hard wood or with ebonite, and this again with a bearing of brass tube,

The end of the spindle passes through this insulated bearing and runs in contact with the spring S (Fig. 2). By this arrangement there is no external circuit for the electrical impulser set up in the coils on the bobbins. To secure this circuit we have to add a separate part, consisting of a steel contact spring C, the form and size of which are shown at Fig. 6. If this spring was made to press equally on the rounded end of the spindle we should again short circuit the coils through the frame, and fail to get any external results. To avoid this, the end of the spindle is shaped as shown, Fig. 5. On referring again to Fig. 6, it will be seen that whereas a round spindle would be always in contact with the spring, this contact is avoided by filing the spindle on both sides, so that it only makes contact at each half-turn of the spindle. The coils are therefore short circuited through the frame at every half-turn of the spindle, and this circuit is broken at every other half-turn. This answers to the make and break contact apparatus of street medical and shocking coils, and the effect is similar, the shocks being given by the jerky impulses sent through the spring S to the stud F (Fig. 2), and through the frame to the stud E every time contact is broken at C. As the working of the machine depends on the perfection of this part, I have entered most fully into details concerning it. The other parts may be described in a few words.

The frame (fitted with a set of multiplying clock wheels consisting of a $2\frac{3}{8}$ inch driving wheel, containing 10 teeth to the inch of circumference, gearing into a pinion fixed on the spindle of the driving pulley). This frame is made of brass, $\frac{7}{16}$ inch by $\frac{1}{4}$ inch, and is usually cast in two parts, but it might be easily formed out of malleable brass, bent to proper form and secured by set screws. On reference to the plan (Fig. 2) the following points will be observed in the form of the frame: A bracket-like projection with a hole in it, will be seen in the top left hand corner; this is made to receive the shank of the handle or key, when the machine is not at work; on the same side of the frame, near the bobbins, the frame appears to terminate, but does not really do so, but is here turned aside between the legs of the magnet, as shown at Fig. 7, where it is seen to support the end of the insulated spindle; at this point, also, two transverse lugs of brass spring out as supports for the magnet, which is here gripped between the lugs and a transverse supporting piece of brass on the other side, secured to the frame by a set screw, the curved part of the magnet being supported by another transverse piece, as shown Fig. 7. The frame is supported in the mahogany box by long screws at M and at C, and by the stud E, which is made to screw into the frame. The handle H is made to screw on the end of the driving spindle, this being screwed, and the shank of the handle bored and tapped to receive it. By this device the motion of the machine is always secured in the same direction; since, should any person turn it the wrong way, the handle will come off. A piece of round leather boot-lace sewn with thread will serve for a driving-band. It will be noticed that a slot is cut in the contact spring C, and that it is secured to the frame by a set screw; this is intended to facilitate adjustment, and it may be as well to state here that the action of the machine may be much impaired by a faulty adjustment of this part. The current is taken off by means of two handles made out of brass tube, connected by lengths of braided wire to two brass pins inserted in the holes of the studs E and F.

The intensity of the current and the severity of the shocks may be regulated partly by the speed of the machine, the "strength" of the shocks increasing with rate of speed. Apart from this, the strength of the current may be diminished or increased at will by actuating an armature A, by means of a knob and draw-bar K. A full-size sketch of the armature is shown at Fig. 9. It is simply a piece of bar iron, $3\frac{1}{4}$ inch by $\frac{5}{8}$ inch by $\frac{1}{4}$ inch, the bottom hole fitted with an iron pin $\frac{3}{4}$ inch in length, and the smaller hole in the position shown in sketch, fitted with a hook of $\frac{1}{8}$ inch brass wire, terminating outside the box in a brass knob. The use of this armature is to act as a divider of the magnetic influence of the magnet; that is to say, when the armature is placed upright against the magnet, as shown in sketches, part of the magnetic influence is exerted on the armature and part on the iron work of the coils; but when the armature is pulled away from the magnet to the position shown by the dotted lines in the plan, all the influence of the magnet is exerted on the revolving coils, and the strength of the current is increased. In fitting this armature we first bore a hole near the bottom of the box, and in the position marked T on plan, to receive the iron pin that forms the pivot on which the armature rests and moves. We then bend a hook on a piece of brass wire, pass it through the small hole of the armature, and secure it there with a grip of the pliers in such a manner as to keep it from slipping out, but leaving it free to move in the hole; then bore a hole in the end of the box for the brass wire to pass through, cut it off when the armature is in the position shown on plan, and fit a small neat brass knob to the end of the wire.

The machine from which the plan was sketched, was enclosed in a neat mahogany box, 10 inches by $4\frac{1}{2}$ inches by 5 inches, fitted with lock and key. Such a machine is sold by Mr. Dale, *of* 4, *Little Britain*, *London*, *E.C.*, for 18s. 6d., and any part of the same

will be supplied by him to amateurs wishing to make up machines.

From information kindly supplied by Messrs. John T. Gent and Co., *Faraday Works, Leicester*, I am able to inform my readers that the above-named eminent firm of manufacturing electricians make a speciality of this class of electric machines, in various forms, from a pocket machine at £1, to parlour machines at £1 13s., and large machines for bazaars and fairs at 15 guineas. With any of these machines the makers supply a twenty-four page pamphlet, showing how to apply the current for medical purposes.

So much space has already been taken up in describing the manufacture of these machines and the principles of their construction, as to preclude any remarks on how to apply the current to give relief from pain. I must, therefore, hold back several sketches of appliances, and instructions for using them, to form the subject of another short article. I will merely say at present that the current from such machines, when properly applied, has often relieved pain in cases of neuralgia, rheumatism, gout, headache, and kindred disorders, and thus proved a useful auxiliary to other means for effecting a cure.

A "MULTUM-IN-PARVO" FOR POULTRY AND PIGEON KEEPERS.

By AN AMATEUR WOODWORKER.

POULTRY and pigeon fanciers having limited accommodation find that the breeding season puts a severe strain upon their resources. What is sufficient for adult fowls is not when chickens begin to appear, and the advent of "squeakers" marks an epoch of overcrowding, unless additional room is provided. Such indeed has proved the experience of the writer, and he now sets forth in detail a plan by which some of the most urgent wants may be supplied. Perhaps it is necessary to state, by way of preface, that the hints given are intended for the use of suburban residents possessing back gardens of moderate size, a small portion only of which is available for the poultry and pigeon yard. In a previous number I have already described my combined poultry and pigeon house, and the following are the particulars of, as I consider, a desirable adjunct.

First, then, the season brings with it several demands. With respect to poultry (1) secluded spots are required for sitting hens, where the nests may be placed on the ground, so that the eggs may benefit by the natural moisture of the earth; (2) dry runs are needed for young chickens, in which they may be housed with the mother hen during wet or windy weather; (3) a dust bath and ash box are wanted for the special use of the growing broods, chickens being particularly plagued by insects; and (4) coops for fattening cockerels for killing are welcome to every hen-wife.

As regards pigeons the most pressing demands are (1) pairing pens, (2) hospital quarters for lame birds, (3) and cages for prize pigeons, or valuable specimens of fancy varieties, usually kept in confinement, such as Fantails, from which it is desirable to breed.

Now I claim that the supply of these seven requisitions, if the articles be purchased separately from the makers of such appliances, must entail a considerable outlay, and there is every inducement to the amateur woodworker to give his leisure hours to the construction of a contrivance which is designed to save him that expense. The outlay for material, as will be seen by the figures appended to this article, should not exceed the sum of fifteen shillings.

It is safe to assume that it is the general anxiety to make as much as possible out of the space at disposal. Were a yard of confined dimensions simply littered with the articles mentioned—viz., sitting coops, dry runs, dust bath, ash box, fattening pens, pigeon pans, and pairing cages—it would be obvious that not much room would be left for the occupants of the yard. Therefore, at the start, it is clear the style of architecture must be perpendicular, and, in fact, the tier principle must be adopted. By doing so the area of the yard in which the arrangement stands is not only undiminished but is actually increased, as I shall presently show. Fig. 1 is a sketch of the completed "Multum in Parvo." Tier 1 is a portion allotted to pigeons, and as the flooring does not extend for more than two-thirds of the length, the birds can readily obtain access to it from below, where on tier No. 2 they are provided with a run, partly roofed, and a compartment in which to nest, reached by holes, and placed within command of the owner by means of a door on the outside. The remaining and lower half of the house is apportioned to chickens. On tier 3 are two boxes—the one containing lime and loam, the other cinder ashes and calcined bones from the kitchener. These boxes are easily lifted, and as they serve to roof over the run underneath, means of reaching the innermost recesses of that part are at once at hand. The sketch represents this lower run shut in by two flaps. Behind the front and larger flap galvanized wirework is permanently fastened. In the case of the smaller flap this wirework is stretched on a frame swinging from above, and so arranged that, fastened back at an ascertained angle, the chickens find room for free

ingress and egress under it, whilst the hen is not permitted to have her liberty, the aperture not allowing of her escape. In fine weather both the outer flaps are opened, thus allowing the light to enter the run, and in themselves providing platforms, of which the chickens liberally avail themselves when basking in the sunlight. Closed, the flaps effectually exclude wind and wet, and render the quarters warm and secure; and again, when both are fastened down, there is ample room for two broody hens, which do not, by the way, appreciate too much light, and require to sit moreover on the soil. It merely requires a moment's attention to convert the same space into fattening pens for cockerels whenever occasion a ses.

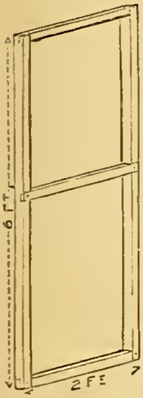


FIG. 3.—FRAME FOR END.

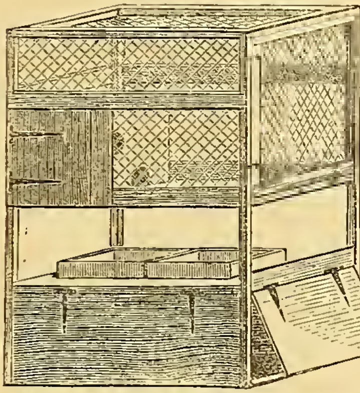


FIG. 1.—"MULTUM-IN-PARVO" HOUSE, COMPLETE.

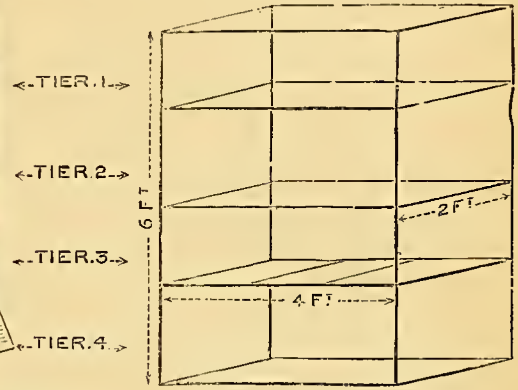


FIG. 2.—SKELETON OF FRAME.

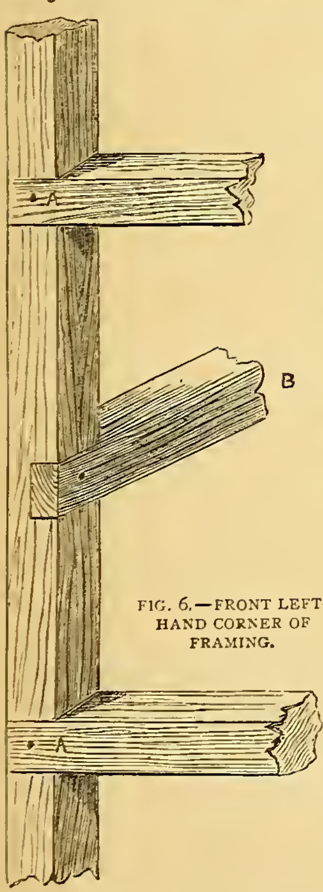


FIG. 6.—FRONT LEFT-HAND CORNER OF FRAMING.

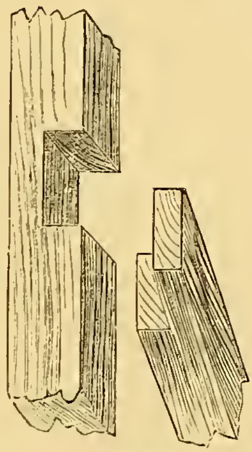


FIG. 5.—CROSS BAR MORTISE.

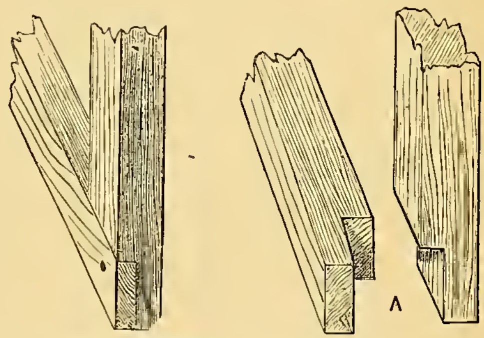


FIG. 4.—BOTTOM CORNER. (A) PIECES DETACHED.

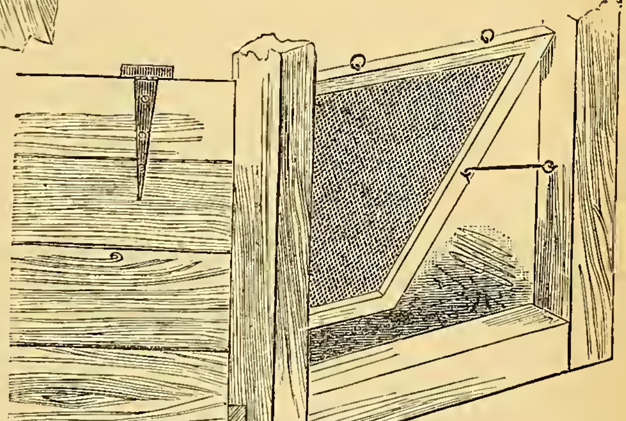


FIG. 7.—FRAME WORK AND FLAP DOOR.

To proceed to the construction of the "Multum-in-Parvo," I may observe that the measurements were decided with especial reference to the economical use of wood as purchased in small quantities at a timber yard. The framework is formed of quartering 1½ inch square, obtainable retail in lengths of twelve feet, at 5d. per length. Fig. 2 gives an idea of the skeleton of the whole, and Fig. 3 depicts a frame, of which it is necessary to make two—one for each end of the house, which, hence, is six feet in height and two feet in depth, the length and breadth of the frame. The frames stood up on end, four feet apart, are braced together on either side by widths of quartering, put eighteen inches from top and bottom. In order that it shall be perfectly clear to the unpractised carpenter how the frames are made, I add explanatory sketches. Fig. 4 represents the bottom corner, A the detached pieces of wood before they are screwed together. Fig. 5 in the same way shows the cross-bar mortise. Fig. 6 gives a portion of the left-hand corner of the entire skeleton, A, A being the cross braces, four feet in length, and B the bar bisecting the frame shown in the smaller sketch in Fig. 2. All the joints are of the simplest mortise; they are quite good enough for the purpose in view, for every board hereafter added to the structure increases its stability. Five lengths of quartering should be ordered, and these can be cut to the required measurements with a minimum of waste A heavy hammer, an inch chisel, and a handy saw are the only tools the workman needs.

Turning again to Figs. 1 and 2, it will be seen that on tier 3 in the skeleton sketch, four short cross pieces connecting the lower pair of braces are shown. These can be of ¾ inch wood 2 inches wide, and two similar pieces can be nailed on the top of the frames from corner to corner, as an additional stay. Two lengths will afford sufficient stuff. With the framework thus erected, the braces on tier 1 will form joists for the flooring, which is to go two-thirds only, or length of the compartment. This flooring consists of pieces of ¾ inch match-lining, 6 inches wide. The rabbet and groove arrangement locks the several boards into one safe whole, which answers the double purpose—that of a roof to the nests below, and of a platform upon which the pigeons are eager to parade in the sunshine. In order to maintain a rapid disposal of rain-water, it will be necessary to give this platform an incline from left to right, which may be done by nailing a tapering fillet of wood upon one end of the joists. The same plan serves for the flooring below, which, in its turn, protects the ash box and dust bath beneath; but it must be remembered, in this case the floor boards run lengthways instead of across, and the fillet without being tapered, must be attached to the cross bar of the left-hand frame.

Again, for the sake of economy, it is best to employ match-lining on the other parts of the house, to be particularized as they come before our notice; suffice it now to say, that three lengths of 16 feet each, at 1d. per foot run should now be procured. Match-lining should be nailed round three sides of tier No. 1, as shown in the sketch in Fig. 1. A door 15 inches wide, is now to be made by battening the wood together, with the planed surface outwards. The door can be hung to the upright by means of 6-inch garnet hinges, at 3d. per pair. To divide the breeding place from the run a few pieces of board nailed together, having pigeon-holes cut therein, may be kept in position by means of a slide at top and bottom, and it will also be necessary to board in that portion of tier No. 2 at the side and back. The tiers, No. 1 and 2, are under control by the addition of the door at one end. Measuring 3 feet in height and 2 feet in breadth, it answers for closing in the ends of both tiers, one large door being more convenient and practicable than two small ones. This door is a light frame, constructed on the same model as that which is given for the frame in Fig. 3; but the quartering stuff used is only 1 inch square, the price being 2½d. per length of 12 feet—of which one will be just enough. It may either be attached by hinges, or, as I prefer it, with latches, which permit of the door being unhooked and carried out of the way. To complete the pigeon part of the house wirework is wanted to enclose the vacant spaces. A mesh of 1½ inch will do, and 2 yards, 2 feet wide, at 4d., with 4 yards, 1 foot wide, at 2d., will be the quantity to be ordered.

Descending to the third tier, all that necessitates attention is the fitting of a skirting to cover in that portion not already roofed, by the two boxes shown in the sketch. Such boxes, old brandy cases, which are thoroughly well made, and measure 20 by 18 inches, I bought of my grocer for fourpence a piece. The skirting consists of the match-lining already obtained.

We have now come to the lowermost tier, which is all the better if made draught free, and for the sake of warmth I here discard match-lining in favour of stouter planks, unplaned, with which I have boarded in on two sides one end, and the back permanently. The flap, or front is of like material, one board in width, and hung by garnet or T-hinges to the brace, or joist above. The structure is skirted with planks, screwed to the four uprights. At one extremity of the smaller flap, drawn partly open in the sketch (Fig. 1), is hung in a similar manner, but as it is now and then required to be thrown right up, it is made of match-lining, as less weighty. It has already been explained that under the flaps wirework (1 inch mesh) is stretched in the front as a permanency, and at the end in the form of a swing door. In Fig. 7

I give a sketch indicating the mode which I find answers, serving to confine hen and chickens, or hen alone at will, according to the angle at which the door is raised and suspended by a stay-hook.

Three coats of paint may now be given, a pound of priming, lead colour, and green being laid on with a medium brush in succession, taking care to allow one coat to dry before the next is commenced. When working, the less humid the atmosphere the better. In damp weather the paint refuses to dry and soon discolours, becoming blotchy.

In conclusion, I give below a detailed account of expenditure for materials, amounting to 14s., in proof that my estimate need not be overstepped. So many are the uses to which the house may be adapted, that the owner will find it worth his while to give it standing room in his yard in all seasons, though, if he chooses, by working with screws instead of nails throughout, every part may be rendered easily detachable and capable of being packed away in small compass, either for removal when changing his residence, or storage during the winter month.

Cost of Materials.	*s.*	*d.*
Five 12 ft. lengths quartering, $1\frac{1}{2}$ in. sq. at 5d.	2	1
Two ,, ,, $\frac{3}{4}$ in. stuff, by 2 in. at 5d.	0	10
Three 16 ft. ,, $\frac{3}{4}$ in. match-lining, 6 in. wide, at 1d. per foot run	4	0
One 12 ft. ,, 1 in. quartering, at $2\frac{1}{2}$d. ...	0	3
One 12 ft. ,, 1 in planking, 11 in., at 1s.	1	0
Two old brandy cases, 20 by 18 in., at 4d. each	0	8
Three pair 6 in. garnet hinges, at 3d. per pair...	0	9
Nails and screw, catches, say........................	1	5
Two yards wirework, $1\frac{1}{2}$ in. mesh 2 ft. wide, at 4d.	0	8
Four yards ,, ,, ,, 1 ft. wide, at 2d.	0	8
Two yards ,, 1 in. mesh, 1 ft. wide, at 4d.	0	8
Paint (three coats)	1	0

ORIENTAL LATTICE-WORK.

By CRABCROSSE.

THE richness of oriental lattice-work cannot fail to strike those who have, like the writer, travelled in countries where the rays of the sun have to be combatted, instead of courted, as in England. Here, lattice-work is almost confined to summer arbours and verandahs, and seldom takes any other form than that of long strips of wood crossing each other at such angles as to show a number of square, or lozenge-shaped openings; while in the East, the variety of patterns is very great, and the effect very rich, especially when several of these occur in one piece of work. For window casements in hot climates, lattice-work is decidedly preferable to glass, since, while withstanding the fierce heat of the sun, it admits air, and sufficient light for the ordinary occupations of an oriental dwelling. The variety of patterns also admits of a variety of colouring, an advantage which English lattice-work cannot be said to partake of, this being almost uniformly painted green.

The uses of lattice-work in our country are so few, that it is only from the amateur that any departure from the established form and colouring of this work can be hoped. We cannot expect a return to the wrought iron verandah work of the early Georgian period; and the writer has no wish to see the cast-iron work of some of the Dutch villas repeated in England. There, however, it is no unusual thing to see the front of a house almost completely screened by latticed galleries extending along the floor line of every storey from the basement to the attics, and cast-iron is the material used, the designs being generally light in character, and full of that ornament which wearies the eye from its monotony.

The lattice-work of the East is, however, very rich; at first sight it may seem a hopeless task for the amateur to attempt to reproduce it. Indeed, it was not until the writer came upon a casement dropping to pieces from ill-usage or neglect, that he perceived how simple was its principle of construction. With the exception of the frames and supports, the various patterns are all made of small pieces of wood, bored, and fitted together with pegs.

One of the most effective in appearance, and at the same time, most commonly met with, is the lattice pattern shown in the large compartment of Fig. 1. To construct this, all that is necessary will be a number of pieces of wood of an oval shape, say 2 inches long diameter, and $1\frac{1}{2}$ inches short diameter, the thickness of the wood being about $\frac{3}{4}$ of an inch; together with a number of pegs about $1\frac{1}{2}$ inches long and $\frac{1}{4}$ inch in thickness. By increasing the length of these pegs, however, the work may be made more open and a greater amount of light be admitted.

These being provided, the circumference of each oval must be pierced with six holes, about $\frac{1}{4}$ inch in depth, and of just the size to admit the pegs. The proper direction in which these holes should be bored, and also the manner in which the pegs are fitted in, will be seen by referring to section Fig. 2, from which illustration the whole principle of constructing these oriental lattices may be seen at a glance.

Upon this principle are constructed all the different patterns shown in Fig. 1, the variety depending entirely upon the form of the pieces of wood used, and the angles at which the connecting pegs are fitted in. In the compartment A of this illustration, the pattern is varied by using flat oblong forms placed

alternately vertical and horizontal; while by substituting oval forms for the oblong, another variety would be obtained. In the compartment B, the form of the pegs is varied, and oalls of wood are used; the manner in which they are fitted together being shown in Fig. 3. In short, there is scarcely any limit to the variety of patterns which may be produced in this kind of work.

Some ingenuity and patience will, doubtless, be required in putting together these lattice-work patterns, and fitting them in their frames, but when this is accomplished, the effect is very striking. As regards strength, this oriental latticing is much stronger than would be imagined; but the size of each compartment ought to be adapted to the strength of the pattern intended to fill it. It will also be best when any extent of this work has to be done, to treat the different compartments as window sashes, and to fit each one into a general frame-work of uprights and cross-rails, for the sake of support to the whole, and to give also the opportunity of "hanging" some compartments to open as doors or windows.

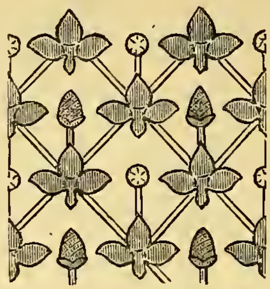


FIG. 4.—STRAWBERRY LEAF, FRUIT, AND BLOSSOM.

Besides the normal use of this lattice-work for casements, it is also employed to divide off portions of large rooms where partial privacy is desired, as in refreshment shops. In Andalusia I have seen an imitation of this kind of work in which the pattern was made by saw-piercing thin wood. In this, the strawberry leaf, fruit, and blossom, which occur so frequently in Alhambresque decoration played a prominent part, and these might also be applied to the kind of decorated lattice-work described above, the pegs being used to form the stem-like connection between the different parts, as in Fig. 4, from which illustration it will be seen that a little chisel-work may be necessary to give character to the forms.

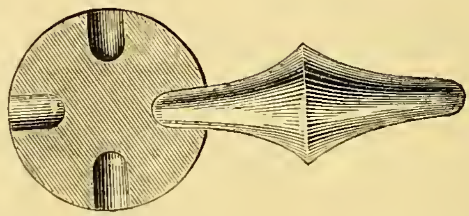


FIG. 3.—WOODEN BALLS AND CONICAL PEGS.

Of the lattice and screen-work formed from the bamboo cane, I do not purpose to speak as the material necessary for its construction is not readily obtained in England, and, therefore, is not available for the amateur. I have, however, seen very fine specimens of this work, and one which I possess exhibits singular beauty of design and great ingenuity in its construction.

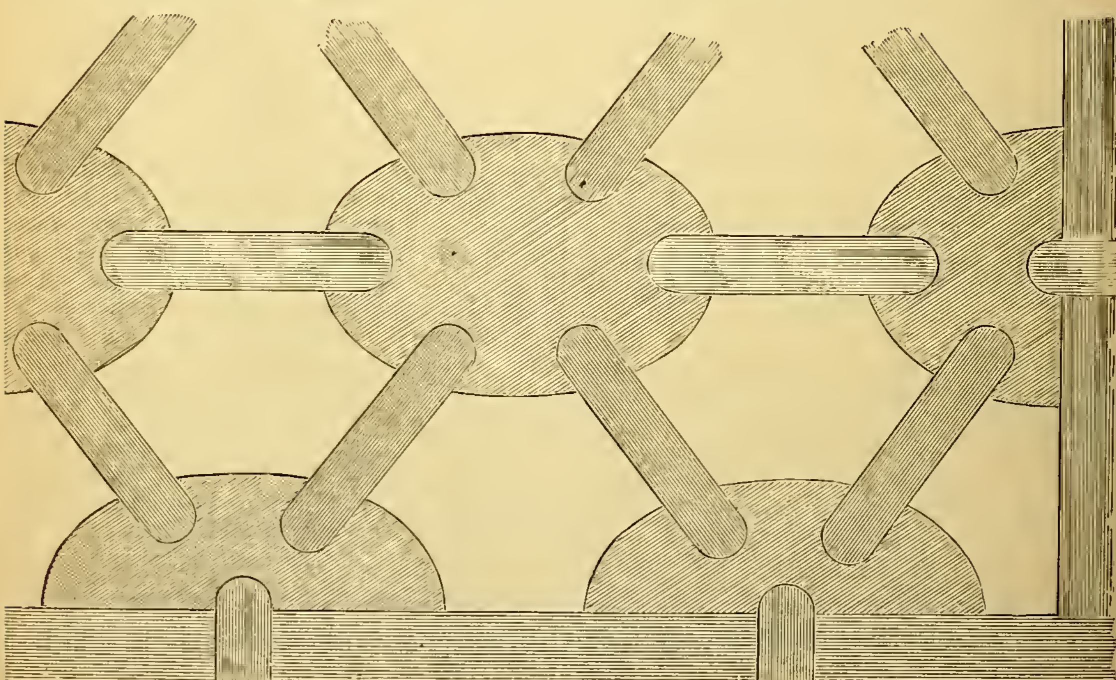


FIG. 2.—SECTIONAL DIAGRAM, SHOWING PRINCIPLE OF CONSTRUCTION IN ORIENTAL LATTICE-WORK.

There are many reasons which lead me to believe that the method of making lattice-work that I have described above will be acceptable to amateur wood-workers; and the chief of these is that in this country there is found so very little variety in lattice-work, or trellis-work, as it is commonly called. This consists, for the most part, of flat laths set at regular and uniform distances from each other, and crossing one another at various angles, according to the pleasure of the maker, being pinned together at each crossing by a wire nail, which is clenched in order to keep the contiguous laths in close contact. Now although trellis-work of this kind is strong, and, comparatively speaking, easily made, it is monotonous in its appearance, especially where there is much of it, and requires relief. It is true that when it is overlaid with climbing plants the trellis is partially, if not entirely, hidden from view, and this just at the time of year when it is most likely to come under notice. There are, however, many garden structures in which the trellised parts remain exposed to view all the year round, and for these, and for all trellised doors, which afford ample scope for the introduction of novel forms and patterns for panels, the oriental style of making lattice is both applicable and desirable. Much of it may be fashioned in the lathe, as, for example, the pattern consisting of balls of wood and pegs in the form of double cones, set base to base, with the apex of each pointing in a different direction, as shown in Fig. 3. Ornamentation of this kind cut in thin wood by aid of the fret-saw, is not so useful, because not so lasting, for such a pattern as that shown in Fig. 4, when rendered in fret-work, would be apt to break. If this mode of fashioning lattice-work panels is resorted to, it will be well to use for the purpose wood formed of three layers glued together, each layer having its grain in a contrary direction to the grain of the other two. Wood of this kind, specially prepared for fret-cutting, may be obtained from Mr. T. J. Syer, *London St., Chiswell St., E.C.*

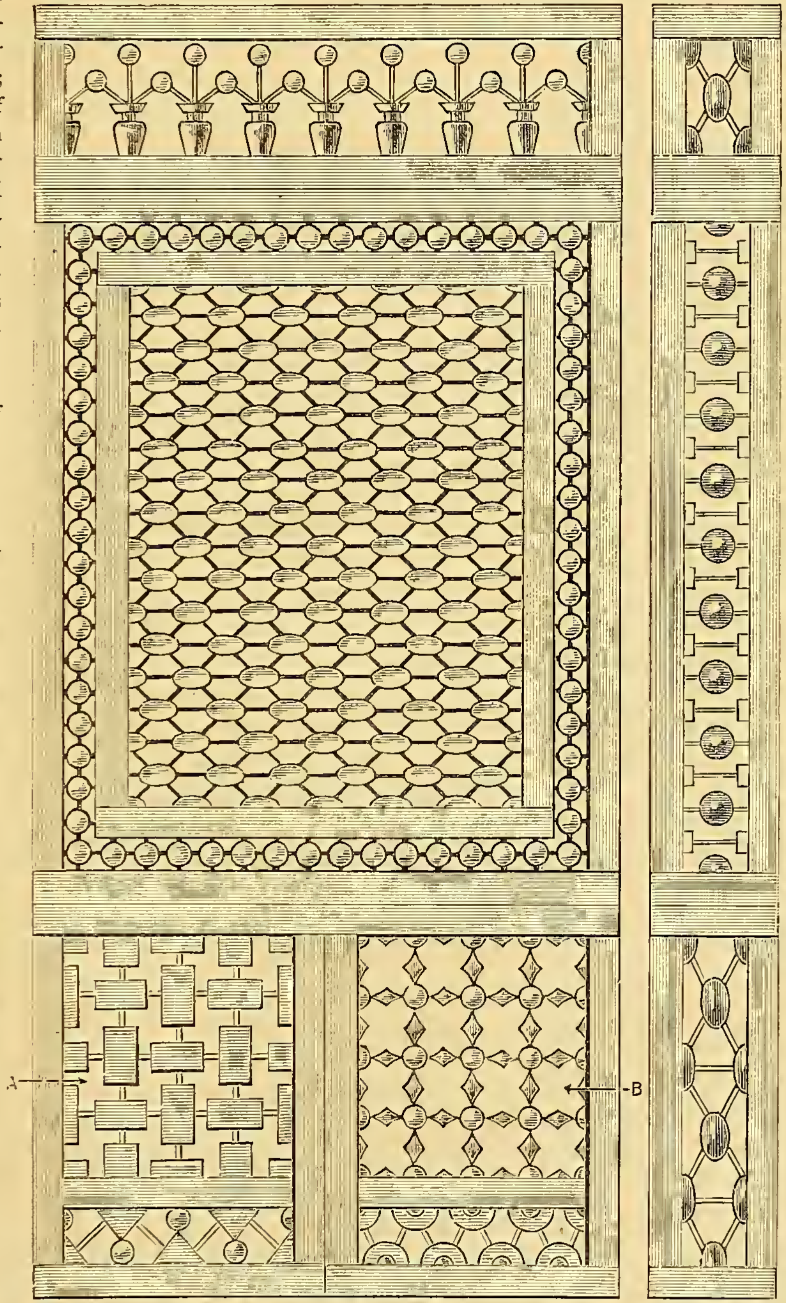


FIG. 1.—EXAMPLES OF PANELS AND BORDERS IN ORIENTAL LATTICE-WORK.

THE VIOLIN: HOW TO MAKE IT.

By EDWARD HERON ALLEN.

VII.—THE NECK AND SCROLL.

WOOD FOR NECK AND SCROLL.—First proceed to prepare the maple for the neck and scroll. This is stored in blocks slightly wedge-shaped $10\frac{1}{2}$ inches long, $2\frac{3}{4}$ inches broad, the depth of the wedge, thinning from 2 to $1\frac{1}{2}$ inches. Plane one side perfectly smooth and even, like the slabs for the back and belly, then with a small plane and T-square square to the smooth side the 2-inch or thicker edge of the block. When this is done, and quite true, take an ordinary cutting or marking gauge, and mark a line along the thick edge $1\frac{11}{16}$ inches from the planed side. Then make the other side smooth and square to the thick planed edge by planing down to the gauged line. This done, you will have a block $10\frac{1}{2}$ inches long, about $2\frac{1}{2}$ broad, one edge $1\frac{11}{16}$ deep, squared and planed, the other edge left rough, and your neck block is prepared for work.

You may now proceed to mark and cut out the neck and scroll. In the *Supplement* (Part 17) is given a Straduarius scroll corresponding with the outline. In page 254 are given directions for copying any scroll on to paper. Let a tracing of this scroll, or your own, be glued on to a thin plank or leaf of wood (like the plank outline), and cut it out in the same way very exactly, so that you have in fact Fig. 47 in thin wood. Now all along, or rather round the line *a a a* of the volute pierce with a small drill small holes, so that the form of the scroll is marked on the plank by a perforated volute. Now on the front of this outline make three little notches at the point, A, B, C, Fig. 47, and you have the complete model for marking the neck and scroll, as at Fig. 33, Vol. I. You will remember that one side of the block prepared for the neck is smooth and squared, and the other side is left rough. Now fasten the plank outline of the neck and scroll on to one smooth face of the block against the squared and planed side of the block, as in Fig. 47, taking the square D E F G to represent the block, and G F its squared side, the outline just touching the edge at the points H, A, B, as in the figure. It is important that it be flush with the edge at A and B, but at H it may be just a shade lower, as in the figure, to allow for the cutting.

Now with the marking-point mark the exact outline, marking a rougher one outside it with a pencil; now by means of a square mark *across* the smooth edge, G F, of the block three lines at the point A, B, C, Fig. 47, exactly at the notches, A, B, C. This will serve as a guide where to fix the outline on the other side, which is done by unfastening it, and fastening it to exactly the same position by making the notches A, B, C exactly coincide with the lines marked across the edge, and mark the outline in the same way with point and pencil, and thus you have two outlines marked exactly on either side opposite one another. Before removing the plank outline from either side, mark the curl of the scroll by thrusting a point through each of the drilled holes, *a*, *a*, *a*, which indicate it on the outline, by which the volute of perforations on the outline will be marked by little dents on the outline drawn on either side of the block.

Now proceed to cut out the block, following the outer (or pencil) line of your markings, with the bow-saw, which must be held very upright to prevent it exceeding or going inside the marking on the underside (*i.e.*, the marking other than the one you are following with the saw). In marking the outline, you must trace round the line *b c d e f g h*, Fig. 47, but not along the line *i k*, if the plank outline does not exactly follow the smooth edge.

Finally, you have now, instead of the neck-block, an outline of the neck and scroll shown by the line *b c d e f g h*, exactly like the plank outline you have been marking from; but instead of being $\frac{1}{16}$ inch thick, it has the thickness of the whole block, and instead of having the volute marked by perforated holes, each side bears the curl marked by small indentations, *a*, *a*, *a*, in the wood. There will be a slight margin of wood just outside the line made by the marking-point. This must now be carefully removed, and the surface of the blocked scroll made perfectly square by means of a chisel and file, till from side to side the block is perfectly plane.

Now proceed to mark the design of your scroll on the back and front of the block. First find the exact centre of the front and back of the scroll block, on the block outline you have obtained by the foregoing directions, which is $1\frac{11}{16}$ inches across, you will find the centre exactly $\frac{27}{32}$ from each side; having got it and set a gauge to this distance, mark a centre line right round the neck and scroll, being careful that the side along which you run the gauge is the plane side from which you squared and planed the two surfaces. With the aid of this centre line proceed to mark your scroll by means of a set of three models, made of pliable zinc or soft brass, taken from some acknowledged master-violin. The outlines, Fig. 48, are taken from the Stradivarius fiddle from which I have taken all the models with which I have presented my readers, A being the front, B the back, and C the front of the volute. First set the fine end of the model, A, Fig. 48, up under the volute on the front of the scroll, so that, as in A, it exactly coincides with your centre line, as shown by the line drawn down the front of the

model and the opening in the centre. At present only the lines A, B (Figs. 49, 50, and 52) are marked on the block, it will now be found that the bottom of A, Fig. 48, just reaches the line A, Fig. 49, so by the model A, Fig. 48, you can mark the lines D, D′, Fig. 49. Next set the top of the model, B, at the top of the scroll block, and similarly mark the back of the scroll with the lines E, E′, as in Fig. 51. Now mark the front of the scroll, setting the model C on the centre line, coinciding with the lines E, E′, Fig. 51, and mark the lines F, F′. These being done, you may roughly elongate the lines D, D′ and F, F′ to G, G′ on back and front, as in Figs. 49 and 51. Be careful, however, to leave plenty of breadth between G and G′, which should be at least 1¼ inch apart.

Meanwhile, the sides of your neck-block are marked as in Fig. 47, which is enlarged at Fig. 50, the volute (*a a a*, Fig. 47) being marked by punctures in the wood, as there described; now draw the line C C′ in the position indicated in Fig. 50, on both sides, and with a fine tenon saw cut down to the lines D, D′ and F, F′; be careful not to go beyond either of them either side, for they are not opposite one another on back and front.

Now set the block upside down in the vice so that about 3 inches are above the bench, and saw down the lines G, G′ to the head, only sawing two or three inches at a time, for the least strain on the head will split off the volute at the line C C′, turning the head down as you reach the line C C′, so as to finish off there neatly. The wood will therefore have been removed along the lines G, G′ to C C′, so as to present the appearance of Figs. 50 and 52. Now prithee be as careful as if you were catching the sparks of a squib in a plate over a powder magazine, and proceed as follows:—Make from the sides to the lines F, F′ and E, E′, on back and front, the three cuts H H, I I, and J J, remove the pieces outside these cuts, and the corners left round the outer volute by them, and take care not to cut *beyond any part* of the lines F, F′ and E, E′ on either side.

You must, at this point, get a good scroll, and copy the obvious shape until, in the rough, you have got the spiral from the cheek of the peg-box to the eye of the scroll, proceeding gingerly with saw and gouges. I cannot describe it, words fail me to express the actual cuttings, suffice it to say the model (without which, as a guide, you cannot get on) must be carefully if roughly copied. When the spiral is roughly hewed out, proceed to make the two sides exactly similar to one another, and perfectly true to the centre line, by means of the spring compasses. Fig. 53 represents the back and front of a properly cut volute; if you cannot copy by eye and hand, leave off fiddle-making, for as a Luthier you are a failure. Having made the lines of the volute, as viewed back and front, as in Fig. 53, perfectly straight and even to one another, with chisels, gouges, and files, proceed with a flat oval plane to plane the cheeks of the peg-box smooth, making them equal by the centre line, by means of the spring compass, and adjusting the breadth from your model by the bow compass (Fig. 18). Now, from the model B (Fig. 48), cut out a thin slip of wood, like Fig. 54, by which to regulate the cutting of the chin of the scroll, K (Figs. 50 and 51), which must now be done with a sharp knife and file, so that when viewed sideways it is pronounced and well-angled, as in Fig. 50, and nicely rounded into the lines E, E′, as in Fig. 51, and at B, Fig. 48. Next, with a fine-bladed knife, cut out and neatly form the corner under the volute, L (Fig. 50), so that it follows the model in the *Supplement*. Now open the spring compasses $\frac{1}{16}$th inch, and gauge a line round the sides of the volute from the eye of the scroll M (Fig. 50) to the outer point C of the line C C′ in the same figure. This edge (as it were) must be left in the subsequent chiselling of the scroll. Taking this line as an outside margin to be left flat, proceed to chisel the scroll, letting the lines which appear perpendicular in Fig. 53, A, A, and B, B, sink in a little towards the heart of the scroll, but keeping the horizontal lines C, C; D, D; E, E, absolutely straight at right angles to the centre line, and exactly parallel with and opposite one another, for these are the great beauties of the Stradivarius scroll, any deviation from, or careless treatment of, these particulars would render the scroll more Guarnerius-like, and unworthy the model we are working on. Now proceed to cut out the grooves down the back of the scroll and round the volute (N, N, Figs. 51, 52); this must be done by fastening the neck downwards into the vice, and grooving it out carefully, taking the depth, etc., from the model you are following. Before commencing to do so, open the spring compass $\frac{1}{16}$th inch, and mark a gauge line round the back and over to the front of the scroll, similar to the one you drew round the sides and volute; the grooves, N, N, must be sunk between this gauge line and the centre line, which latter must be left strong and clearly defined. One of the great beauties of the Stradivari scroll is that these grooves are very well marked and finished, and the outer edges of them are deeper, *i.e.*, the curves are deeper than those rising to the centre ridge (as shown in Fig. 55). This you will see on consulting your copy. These grooves must be equal on both sides of the centre line, and must come right over the scroll and under the volute to the point L (Fig. 50), but this last had better be left till the peg-box is cut out, which may now be done, first marking it by opening the marking compass $\frac{3}{16}$th inch, and drawing a line down each side of the front of the scroll and

along the line A (Fig. 52), so as to enclose a space as shaded on Fig. 52. N.B. In case by the chiselling of the chin, the line B is not exactly on a level with the base of the chin, as at Fig. 50, it must be corrected, *i.e.*, the line B (Figs. 49, 50, and 52), must be exactly opposite the chin, and the line A brought as before just $\frac{9}{40}$th inch (the breadth of the nut), above it, as in *Supplement*. The peg-box, therefore, being marked as in Fig. 52, proceed to cut it out, beginning with a small gouge, and going on with gouge, knife, and flat chisel, till the peg-box is cleanly and sharply cut, as set down on page 255, Vol. I. The cheeks are a *little* thinner just above the nut than elsewhere, to allow the G and E string to go from their pegs to the nut, clear of the cheeks, and at an equal distance from the others. Finish the peg-box by scraping the bottom of it with the flat edge of the chisel, and file the insides of the cheeks, and also the outsides, quite clean and smooth with a flat file. File also the fronts of the cheeks, to have them clean, smooth, and sharp-cornered, as in Fig. 55. Your scroll is now therefore cut; as I warned you before commencing the description of the process, is, perforce, meagre, and you must get a well-cut head as a model, which you must work from more than my directions, which, after all, can only serve as an outline of procedure. The measurements also on page 255, Vol. I., are only approximate; they vary, of course, with every model; and in this also you must be guided by common sense and eye, without which you can never make a fiddle, much

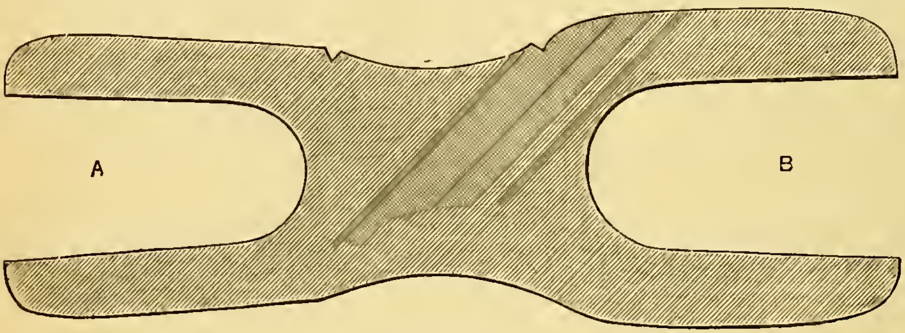


FIG. 59.—MODEL FOR CUTTING NECK AND SHOULDER.

less its head. This done, finish off the head as near as you can with the chisel, then scrape it well with a scraper, and sand-paper it thoroughly all over the curves and in the corners of the volute. In cutting the grooves on the back, etc., mind and leave the centre mark prominent and untouched; the sand-papering, etc., will remove it from the top of the ridge. To sand-paper the grooves you will find it a good plan to roll a piece of sand-paper round the end of a penholder, and work thus with a cylinder of sand-paper. When thoroughly sand-papered, wet the head all over with a brush and cold water, this (as in the case of the back and belly) will throw up any faults, defects of scraping, etc., after which it must be thoroughly re-scraped, if necessary, and re-sand-papered, which operations must be gone through some two or three times. Be most cautious not to alter the character of the head, or spoil its lines by too vicious sand-papering. When this is done, proceed to bevel off the edges of the head, all round the head and volute (but not inside the peg-box), extending the bevel to lines, which should be very carefully and exactly gauged round the corners $\frac{1}{20}$th inch from the edges. Begin this cutting with the knife, and finish it with a file to make it even, removing the file marks with fine sand-paper (but keep the edges of the bevel sharp). This done, dip the head in water for the last time, and when thoroughly dry polish it up well with finest glass-paper, including the eye of the scroll, which must be perfectly flat. As sand-papering the eye in the ordinary way would almost inevitably result in rounding off its edges, you will find it best to place a piece of

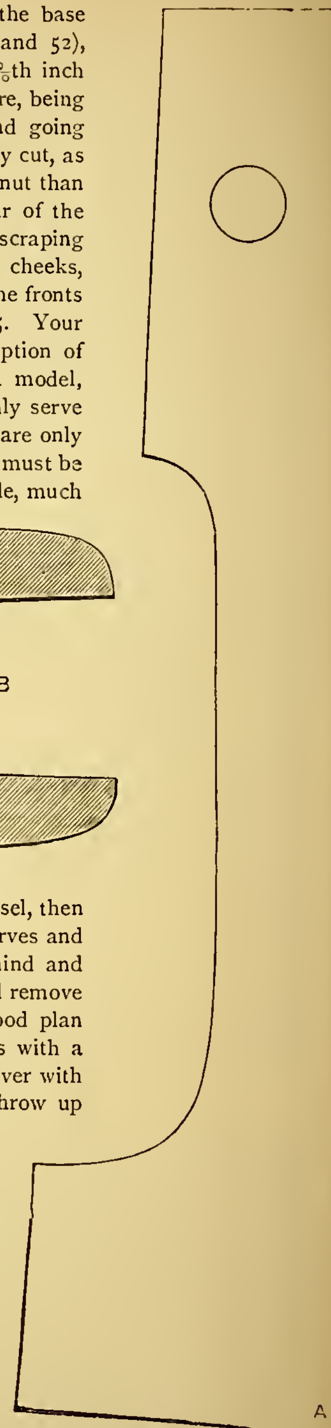


FIG. 56.—NECK MODEL. ACTUAL SIZE.

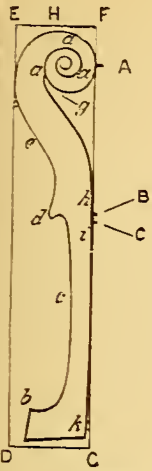


FIG. 47.—MODEL FOR MARKING NECK AND SCROLL.

FIG. 55.—SECTION SHOWING FRONTS OF CHEEKS.

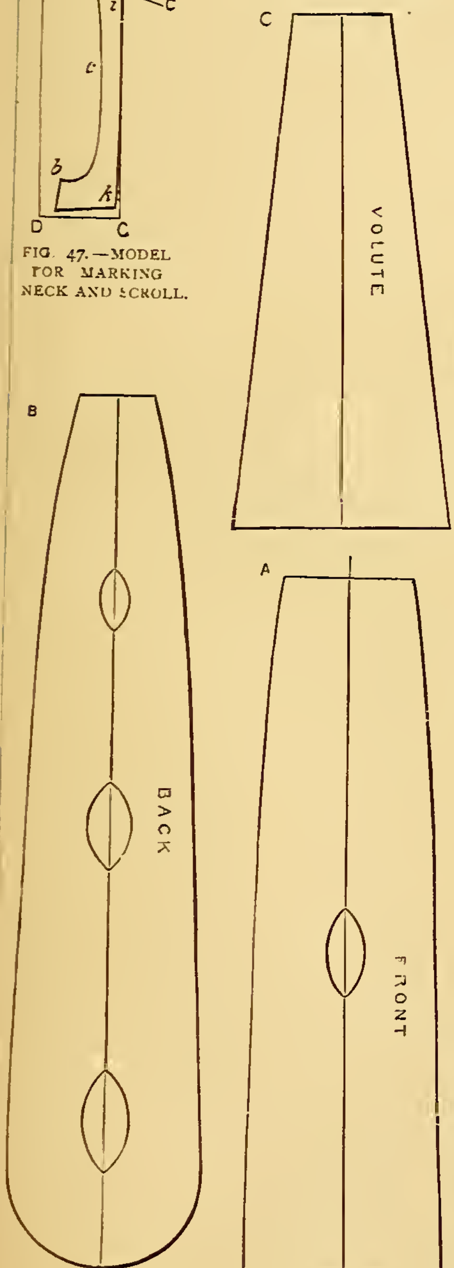


FIG. 48.—OUTLINES OF SCROLL.

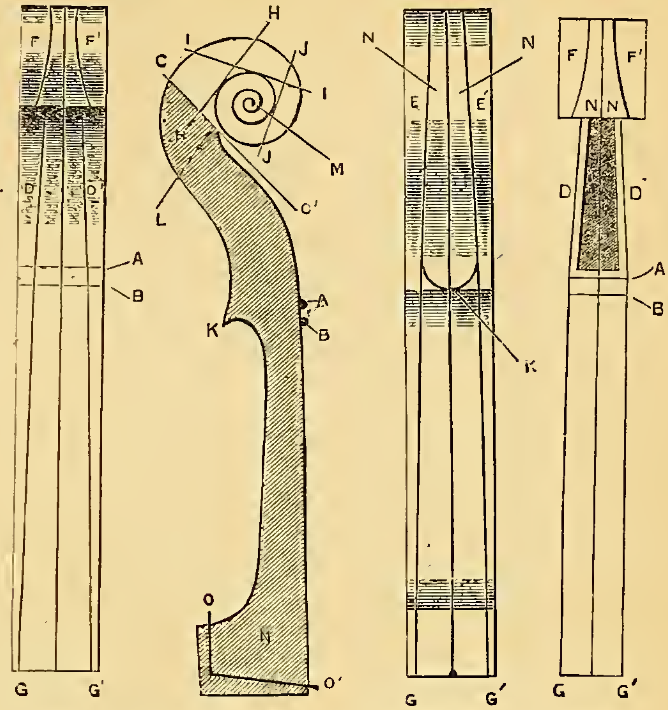


Fig. 49. Fig. 50. Fig. 51. Fig. 52.

FIGS. 49–52.—STAGES IN CUTTING NECK AND SCROLL.

FIG. 58.—SHAPE OF MODEL FOR FINGER-BOARD.

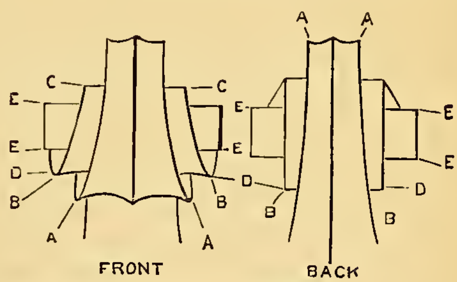


FIG. 53.—FRONT AND BACK OF PROPERLY CUT VOLUTE.

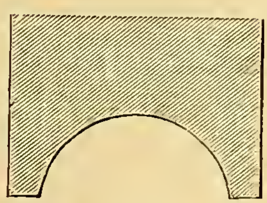


FIG. 54.—SLIP OF WOOD FOR REGULATING CUTTING OF CHIN OF SCROLL.

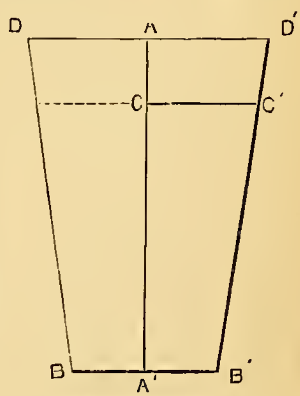


FIG. 57.—SLOPE OF SHOULDER.

sand-paper on the bench, and rub the eye of the scroll flat upon it. Your head is now finished, and it remains only therefore finally to shape the neck and shoulder before setting it upon the body of the violin. For this purpose you will require a neck outline, which, though properly used for splicing heads (an operation described further on), is useful here as well, and so may now be made. It is represented by Fig. 56, actual size, and may therefore be copied in facsimile on a thin leaf of wood. From the line B (Figs. 49, 50, and 52), measure down the centre line, and make a mark at a distance of $5\frac{7}{16}$th inches from B. Now, with a square draw a line across the face of the neck (as at G G′, Figs. 49, 50, and 52), and laying the neck outline (Fig. 56) on the side of the neck and scroll, so that its lower point A is on the line drawn across the neck, as above, and its straight edge corresponds throughout with the flat side of the neck, mark on the rough shoulder of the neck, as it is at present (N, Fig. 50), the slant and outline of the true shoulder (as at O O′, Fig. 50), as determined by the neck outline (Fig. 56); remove all wood well outside these lines, with a fine tenon saw, and with a flat chisel and plane slope off the sides of the shoulder till the under surface presents the appearance presented by Fig. 57. This is done as follows: Note the point on the line D D′ (the lower edge of the face of the neck), where the centre line, which extends from the nut throughout its length, ends at the point A. From the point A, by means of a square laid on D D′, draw a centre line A A′. Open the spring compasses $\frac{7}{20}$th inch, and mark on each side of A′, the points B, B′, and finish the slopes D B, D′ B′, which must be quite straight, true, and, above all things, plain. You can now proceed to fix your neck and scroll on the body of the fiddle. With the spring compasses ascertain the exact centre of the belly between the crannies of the two *ff* holes, and make a small mark; in like manner find and mark the exact centre between the edges of the upper bouts at their broadest part. A flat edge laid along the belly coinciding with these two points, will naturally divide the belly throughout its length into two parts, at its exact centre; by this means mark the exactly central point of the top edge. Now open the spring compasses about the distance C C′ (Fig. 57), and mark two points at equal distances on the top edge, from the point you have marked in the centre of the top edge, in the same manner as when you were marking the place on the lower edge in which to fix the rest. At these points make two cuts, extending vertically and horizontally, through the edge as far downwards and inwards as the top and surface of the ribs. In the hollow thus cut, set the shoulder cut as at Fig. 57, so that the end B B′ goes against the button left on the back. If the cuts are not wide enough to allow B B′ to touch the button, recut them a little wider. Be careful, however, not to cut them too wide; though, if by accident it should be so, by planing down the end B B′, the neck will go farther back and fill up the space between the cuts.

The neck and shoulder being thus held on to the top of the fiddle, see that it is quite straight, and mark *on the top of ribs* the lines D B and D′ B′, with a fine marking-point or the point of a knife. Holding the knife firmly, deepen this mark by drawing the knife down it (being careful not to let it slip on to the belly at the end of the cut) till you have cut quite through the ribs. Now remove the wood between the lines, cutting away equally belly, ribs, and block, till you have hollowed out a chamber (as for the rest), quite square and clean cut, $\frac{1}{4}$ inch deep all over, being so exactly the shape of the shoulder (Fig. 57), that the latter fits quite tightly into it. The under surface of the shoulder must be planed until from the nut (line B, Fig. 52) to the end of the neck, G G′, Fig. 52) is a distance of exactly $5\frac{7}{16}$ inches. The planing must, however, not alter the slant determined by the model figure. The depth of the shoulder will vary with the height of the sides. The back of the shoulder (O, Fig 50) must be cut so as to fit exactly against the button, and, when thus fitted, the front of the shoulder (O′, Fig. 50) must project exactly $\frac{1}{4}$ of an inch above the belly. Besides fitting exactly, the neck must be set exactly straight to the axis of the instrument. This is tested in three independent ways to ensure perfection, which is very hard to get. The neck being fixed in without glue: 1st, Hold the back of the fiddle level with the eye, so that you see the back joint quite straight from the rise of the arching to the button; if the neck is on straight, the centre ridge of the back of the scroll will coincide with and form a continuation of this line. 2nd, Hold the belly similarly, so that the mark you made between the crannies of the *ff* holes coincides and forms a line with the point A, Fig. 57, at the bottom of the neck. If the neck is straight, the centre ridge on the front of the volute of the head will coincide with and continue this line. 3rd, Prepare a ridge 6 inches long, 1 broad, and $2\frac{1}{2}$ inches high at the broad end. Now set the fiddle on its side, and slipping the wedge underneath the scroll, note the point on the side of the wedge where the eye of the scroll first touches it. Now turn the fiddle over and set it on its other side; repeat the process, and if the scroll touches at the same point, it stands to reason that if your model is regular, the head and neck must be exactly true to the axis of the instrument. This is the best, because the most certain test for the fiddle-maker. When a fiddle is very old and knocked about, the outline is sometimes

untrue, and then it fails ; but for the present it is the best for our purpose. Having ascertained, therefore, by these means, that your fitting is right, proceed to glue in the neck. Fill the chamber, and smear the button with good strong glue, press the neck in as hard as you can with the hand, and just rapidly repeat your tests, to make assurance doubly sure ; then with a strong iron cramp, cramp the shoulder to the button, protecting the latter with a slip of wood, seeing that the shoulder is well pressed to the bottom of the chamber. Apply the screw button of the cramp to the face of the neck, pressing as hard as you can. Wipe off the superfluous glue with warm water, and set the fiddle to dry. The next thing, before shaping down the neck, is to cut and glue on the *false finger-board*, which is a finger-board made of pear or sycamore, or other hard wood, to take the place for the present of the final ebony fingerboard, and to protect the edges of the neck till we are ready to fit up the fiddle. For this purpose we must prepare what is called the fingerboard holder, which is a wooden contrivance, shaped as in Fig. 58, in which the finger-board (false or final) is held for working on, and to serve as a guide to the outline and shaping thereof. It is composed of a slip of wood, A, represented by the shaded part, 1 inch thick and $11\frac{1}{8}$ inch long, being $\frac{15}{16}$ in. broad at B and $1\frac{11}{61}$ in. broad at C; it is hollowed slightly down the centre, as shown in section. This is enclosed between two walls, D D, formed of two other strips of wood, high enough to stand $\frac{1}{10}$ inch above A on each side. A piece of wood the shape of A may be pushed into this, and held firmly whilst being worked at, the scooping out allowing of its being inserted curved side downwards.

To make the false fingerboard, take a piece of wood as aforesaid, of the shape of A, Fig. 58, and being 6 inches long, 1 inch broad at the narrowest, and $1\frac{17}{10}$ in. at the broadest ends. Set it in the holder and render one side absolutely plain. Turn it over and replace it in the holder, and having reduced it to a thickness of $\frac{1}{5}$ inch round the top approximately like that of a real ebony fingerboard. Now go over the face of the neck of your fiddle with a fine steel plane so as to render it quite plane and level (but not so as to work it down thin) so that the false fingerboard lies close upon it. Take a gouge and hollow out a trough along the under or plane surface of the false fingerboard, so that it will not present too great a glued surface to force off when you remove it to make way for the permanent one, and smearing what is left of this under surface with glue; set it on the neck, the narrow end being flush with the lower edge of the peg box (line A, Fig. 52) when it will be found just to project about $\frac{1}{2}$ inch or a little more over the belly. Fix it with three iron cramps, one just below the chin of the scroll, one in the middle, and one at the button (as in fixing the neck) which latter must be protected by a slip of wood between it and the lower arm of the cramp. When this is quite dry, proceed to finally shape the neck with a sharp knife. First cut the button to the present rough shape of the shoulder, being careful to slant the knife upwards, and not cut down into the back towards the joint, which is a very ugly feature in badly-made fiddles. Now prepare a model, which is represented in actual size at Fig. 59, from which it may be prepared ; the roughly-hewn neck must be cut away with the knife, being most cautious not to let the knife slip and injure the head, till the end A of Fig. 59 just fits over it below the chin of the scroll, and the end B just fits over it above the shoulder. It is best that at these points the forks of the model should, in the first stage of the cutting, barely go over the wood, it will be sufficient to get these diameters approximately right, and leave the finish till the neck approaches the finish, besides the filing and polishing will still further reduce them. Before beginning to shape the shoulder, cut the top of the button, till the distance between the chin of the scroll and the top of the button is just $4\frac{7}{8}$ inch.

Continue to cut down the neck and shoulder till the model (Fig. 59) goes well over both neck and false fingerboard at the two points above explained. With the smallest flat steel plane smooth the sides of the false fingerboard, till the line where it joins the neck is only as visible as that of the back or belly. Having done this, finish off the button, making it as even and circular as possible, and rising well at a right angle (neither more nor less), from the edge of the back. When you have shaped the neck as far as possible with the knife, take a good rasp and obliterate, as far as possible, the marks of the knife, but not more ; then with a pair of files obliterate the rasp marks, using a flat fine one for the neck, and an oval fine one for the shoulder and chin of the scroll. Bevel off the outer edge of the button just as much as (in fact to match) the bevel of the edges. Now, with a scraper, scrape the neck and shoulders as smooth as possible, after which give it a good polishing with coarse sand-paper, and then another with fine. Now go all over the fiddle, especially the edges, with fine sand-paper, to clean off any dirt which may have accumulated since the last rubbing, and having satisfied yourself that the fiddle is as clean and smooth as you can make it, your instrument is finished "in the white," and can at once be varnished preparatory to fitting it up and playing on it. If it is in the summer time this can be proceeded with at once, as described in the chapter on finishing ; but if it is in autumn or winter, hang up your fiddle, if possible, in a dry

glass case till the return of the hot weather, and it will be greatly benefited by the seasoning "in white." It remains only to give instructions for varnishing and bringing up to melody point, but I may now take the opportunity to say that if I am called on to do so by those who have followed me in Violin-making up to this point, I will, at some future time, describe the following processes, as applicable to the directions I have already given in the preceding chapters; viz.: 1. How to make a violin on an *inside* mould. 2. With a slab, or whole back. 3. With a spliced, or joined head, which will show my readers how to put a new neck on a fiddle, whose original neck is too short, or in any other way defective, but whose head it is of course archidesirable to retain. 4. With the purfling inlaid before the tables are glued to the sides, and differing in other slight particulars, by which identical results are produced by different means. I will, if they are called for, give the mould and models, as before in actual facsimile, but of the best pattern of Guarnerius, so that the readers of AMATEUR WORK may have the advantage of having both of the great models to work on, besides a thorough practical, theoretical, historical, and scientific knowledge of the art and manual processes of Fiddle-making.

(*To be continued.*)

BRASS CASTING AT HOME.

By F. J. DURRANCE.

IV.—TURNED WORK AND CORES (*continued*).

WE will now take Fig. 14, which is quite different to the others. It is a slotted face-plate for lathe, and may be taken to represent the plan; the section, vertically, and elevation, being shown in Fig. 15. The pattern is first turned, then the prints for the slots glued on. A strip of wood is then planed up for a core pattern, to wrap paper round. Remember it must be as wide as the print, and the thickness of face-plate added, Fig. 16, so that when the pieces are cut off the core-strip, and dropped into their places in the mould, they will touch the top half of the mould, and make square holes through. The casting, Fig. 17, shows pattern in plaster. Proceed as follows:—Get a circular card-board box, cut a hole in the centre to let the portion, A B, in Fig. 17, drop through; run a little wax round to make tight, to prevent plaster running out. Now pour in plaster; dry; take off paper box; wrap paper round as before; and then put on the top, making holes for pouring in plaster, etc.

As we have got thus far in our subject, I think it would not be out of place to give a brief *resumè* of the process of sand-moulding for the benefit of those of our readers who would like to experiment a little in this line. The instructions already given will be of great use in sand-moulding; though the process is slightly different, yet I think it is not out of the reach of amateurs. The first thing he will require is sand; this he can obtain from any brass moulder if he lives in a large town, if not, any of the dental depots in London will send a bag for about a shilling; Claudius Ash & Sons, *Broad Street*, *Golden Square*, *London*, for instance, will supply you. The moulder will let you have as much as you can carry for about sixpence. The next thing required is a moulding box, a useful size for an amateur would be about six inches by eight inches, and about eight inches deep; it is made as a square frame (no top or bottom as an ordinary box) and then sawn in two about the middle, some arrangement must then be added to ensure the two halves always going back into the same place after separation; this can be effected, for instance, with three small bolts used in fastening cupboard doors, the bolt being fastened to the top half, and the eyelet part, into which the bolt shoots, being screwed to the lower half. We will suppose we are going to mould the cap chuck, Fig. 10. Commence by slightly damping the sand, just sufficient to make it adhere when squeezed in the hand; now lay the bottom half of box on a flat board, ram it full of sand, smooth off with a piece of wood, place the pattern, *mouth* downwards, on the sand, and in the centre put the top half of box on and fasten the bolts in their places. Something must now be sprinkled on the sand to prevent the next lot of sand sticking to the lower half; this can be a little powdered charcoal put in a piece of muslin, or some fine dry sand. Next proceed to ram the top half of sand. When finished, *turn over the box* and separate. What was firstly the bottom half will now be the top, out of this knock the sand first rammed in, put back into its place and proceed to ram in sand, which will now go into the large hole in the pattern. When finished, tap all round gently with a piece of wood, then separate. The pattern must now be drawn by driving into it a small spike; then gently knocking from side to side, the pattern will draw out of the sand. A pouring hole, or gate, as it is called in the trade, must now be made—no vent is required in this instance as the sand is porous. The box is now fastened together and the metal poured quickly in. Cores are inserted just the same as for plaster mouldings.

We will, after this slight digression, return to our subject, and now take an example of an irregular core, and a very advanced specimen of core work. This brings us to the making of a core box, as our

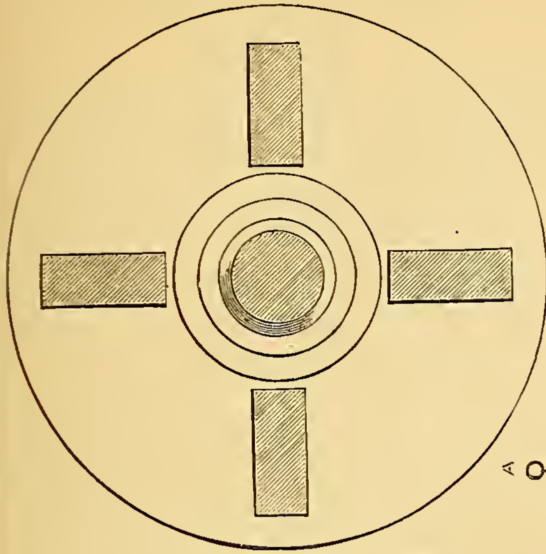


FIG. 14.—SLOTTED FACE PLATE FOR LATHE.

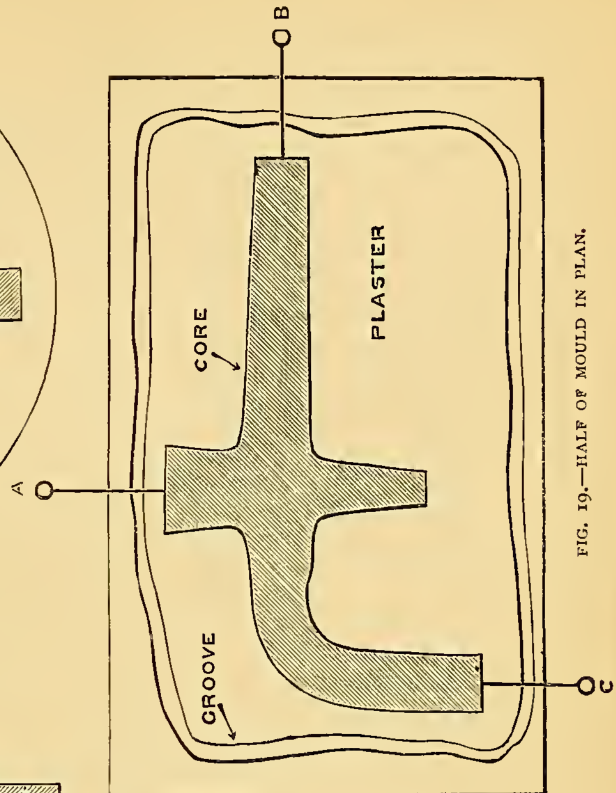


FIG. 19.—HALF OF MOULD IN PLAN.

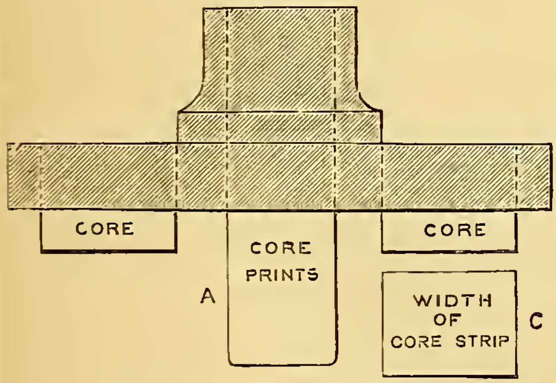


FIG. 15.—SECTION AND ELEVATION OF FACE PLATE.

FIG. 16.—CORE STRIP, SHOWING WIDTH.

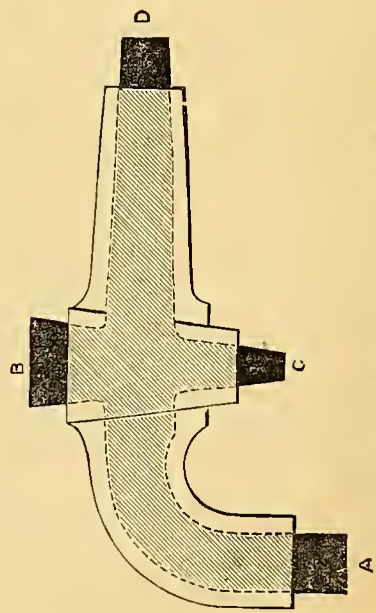


FIG. 18.—BRASS WATER-TAP IN SECTION.

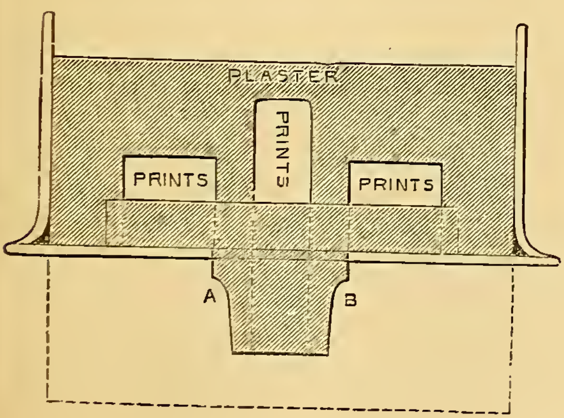


FIG. 17.—PATTERN IN PLASTER.

previous methods are of no use in this instance. There is scarcely any limit to the shape of cores which can be made in these boxes. The example, Fig. 18, is part of the familiar water-tap, called, I think, a plug tap. Firstly, make the pattern, then glue on the core prints, A, B, C, D, the dotted portion, showing shape of cored hole, being shown plainly in the diagram. Now for the core itself. Make a pattern of the core in wood, or plaster of Paris will do, cut out with a knife from a lump which is not quite set, then finish off nicely when quite hard, and coat with wax, as before. In fact, proceed just as if you were going to make a mould to cast in. Now put in needles, as for pillar in Fig. 8. A mould in two halves is now made, as shown in plan Fig. 19, only make it a little thicker than ordinary, to stand pressure. When dry, take out pattern of core, which is now done with. We have now our core box, and with it can make as many cores as we require. In ordinary practice, these boxes are made of wood, in two halves, and dug out with gouges to the shape required, one half in each mould, with pins inserted, to always go back in same place. For our method I think the before-mentioned plan is the best.

Now to use the mould. Thoroughly dry, then coat the mould slightly with wax; slightly oil; mix core compound as before; lay two halves of core box face upwards; fill each with plaster, quite full; as soon as it is very slightly set, so that you can turn it over without spilling (don't let it set too much), place the two halves together, the groove will make it go into its proper place (for core boxes make a very deep groove); now put a pressure on the mould—I usually stand on it with one foot for a minute, then put a weight on till dry. Then open and shake out core; trim with a knife, as plaster generally runs between faces of mould; now dry in the oven, as before; drop into its place in mould of Fig. 18, as usual. I think these examples embrace most of the work an amateur could manage.

I must now conclude this subject for the present. It has just struck me I have written part of a treatise on moulding and casting, and I have no doubt the amateur pattern-maker may learn a hint or two for pattern-making generally. I hope he may. He may have many mishaps, but he must let his motto be, *Nil desperandum.* He will find the practice of the art that I have been endeavouring to describe and explain extremely useful and valuable, for it will enable him to carry out for himself, and with his own hands, many a piece of work, to achieve which he must otherwise have sought the aid of others, and thus to become independent of assistance of this kind, an end which every amateur, whatever may be his special hobby, should seek to attain.

A COAL-SCUTTLE IN CARVED OAK.

By MARK MALLETT.

ONE of the many correspondents of AMATEUR WORK has requested that a design for a coal-scuttle in carved oak might be given in these pages, and I have been asked to comply with the said correspondent's request. I do so the more gladly, because directions for making an article of such general use cannot fail to be of service to a large number of amateur carvers and carpenters; and, indeed, it is a curious coincidence that the Editor's communication found me with such an article in progress in my own workshop, for use in my own study.

The correspondent in question has old oak by him, of which he desires to make use. His case is probably that of others. A small article like a coal-scuttle offers a good opportunity for using up fragments of carving which are not large enough for any more important piece of furniture. There is no reason why the plans now given should not be so adapted as to utilise such scraps. I shall, therefore, have something to say under this head presently. As, however, likely to be of the greatest use to the greatest number, I have given drawings of new carved decoration for all the different parts.

In Fig. 1 will be seen a rough general sketch of the whole. This sketch is not, as are the illustrations of the different parts, made to scale. In such an article, exposed as it must be to constant rough usage, strength is a more essential quality than lightness. I have, therefore, supposed that, with the slight exception of the handle, this coal-scuttle will throughout be made of inch oak. If, however, the worker prefers to make his work lighter, both in appearance and reality, which he may do safely if he proposes to line the inside with metal, he can substitute three-quarter oak for the sides and ends. The only difference this will make with regard to the working drawings will be that he will have to move the inner lines of the dovetailing a quarter nearer to the ends. The bottom, lid, top, etc, he is advised to keep to inch stuff.

The dimensions of this box are: length, 18 inches; height, exclusive of handle, 13 inches; breadth, 11 inches. The various working drawings, except where otherwise specified, are made to one-fourth of the actual size.

In point of artistic effect, the lid and top, and especially the lid, owing to the angle at which it is placed bringing it directly under the eye, are the most important parts of our work. These, therefore, will

be the chief parts for decoration. In Fig. 2 I have given a design for the lid ; in Fig. 3, one for the top.

From Fig. 2 I can promise a rich effect when carved. The pattern may at first sight appear an elaborate one for the purpose. But the decoration is little beyond surface-decoration, and is of a kind that may be executed with much rapidity. Carvings in this style are frequent in the panel-work of the seventeenth century. Such work is quickly carved, because the various incisions are generally to be cleared out with one or two strokes of the tool merely.

In Fig. 4, I give a section, full-size, of one of the interlacing bands. The lines which bound it, marked A A, are made by a single sweep of the V-chisel, or dividing-tool. The central hollow, B, is made by a similar sweep of the gouge. The round and crescent-shaped markings which enrich the hollow are each formed by two cuts of a smaller gouge, the corners of which have been rounded off. Instead of these the enrichment might be made by simple indentations with a grounding-punch, which would be done still more rapidly ; or by a mixture of the two, as we frequently see in old work. About a quarter of an inch would be the greatest depth to which any part of this decoration would extend.

The central flower may be cut with equal rapidity, its outline being shaped by two or three double cuts with a large gouge, and its veins put in with the dividing-tool.

Scarcely more labour will have to be spent on the ornamental border. The edge has first to be moulded by plane or hand, as shown at C, and then enriched with an old English rendering of the Classical "Egg and Dart" pattern. Here, again, a couple of double strokes with the gouge will express the semi-circular leaves which take the place of "eggs." Three strokes with a smaller gouge—one down the centre, and one to each side—will vary the surface, and give a pleasing play of light and shadow; and veins running through tbere are marked with the dividing-tool. A simple deep notch in each of the intervening spaces between the leaves stands in place of the "tongue," and completes the border.

In illustration of the speed with which the flat band-work decoration can be carried out, I may say that in about three evenings I have filled the whole six panels of a door with a pattern not less intricate than tbat before us. My study is surrounded with a dado of old oak panelling. Most of the panels came to my hands plain, some half-dozen only being enriched in the manner described with ancient carving. All the rest—somewhat more than thirty panels—I have decorated to harmonize with the ancient work, and I was surprised to find how quickly and easily the task was accomplished.

If old oak of the given thickness is used, there will be little probability of the lid warping ; but if the wood employed be new, it may be as well to guard against this danger by clamping.

In Fig. 5, we have a view of the side of our coal-scuttle. Its eccentric shape, and the way in which it is trenched upon by the support of the handle, render it an awkward space to decorate satisfactorily. This, however, is of less consequence, as it will not catch the eye like the upper parts of the box. It will be seen that no attempt is made to conceal the dovetailed joints at the corners, but that they are rather emphasized and made prominent. In such an article dovetailing is wanted to secure due strength, and that being the case, it would be false taste to try to hide it. An incised line, cut with the dividing-tool, marks the inner limit of the dovetailing, and from this the wood outwards is slightly rounded off, as it is also at the corners. The thickness of the bottom is also marked in a similar manner ; and thus a border is formed round three sides of the space, along the centre of which a row of screw heads forms a dotted line. The demands of construction are thus turned into ornament.

And here it may be well to explain the manner in which the bottom is fixed in. It is fitted with a rebate, as shown in Fig. 6. The object of this is as much to avoid the possibility of dust finding its way through, as to secure strength. If joined as directed, and glued, the joints can scarcely fail to be dust-proof, whilst further strength is given by the use of inch-and-half round-headed screws, as shown in the illustrations. The heads of these, showing like a row of studs round the edge, far from being unsightly, add to the ornamental effect of the work.

A metal lining, best made of zinc or galvanized iron, for the inside of the box, saves the woodwork from much rough wear, and is cleanly. The amateur may not, however, choose to incur the expense of this, and if the work is carried out as directed there will be no real necessity for it.

In this view, as also in that of the front (Fig. 7), the feet on which the scuttle stands are shown. They are simply four pieces of inch oak, $2\frac{1}{2}$ inches square. They are rounded at their edges and decorated with a little gouge-work. These feet, being fixed with flat-headed screws to both those pieces which meet at the corner, help to support the bottom, and greatly strengthen the whole work.

As the back (Fig. 8) can rarely be seen, it would be useless to waste carving upon it. To it is screwed the catch (Fig. 9) to receive the coal-scoop. In those districts where large coal only is used, a scoop is useless, and this feature may be omitted.

The handle (Fig. 10) is made of a square strip of

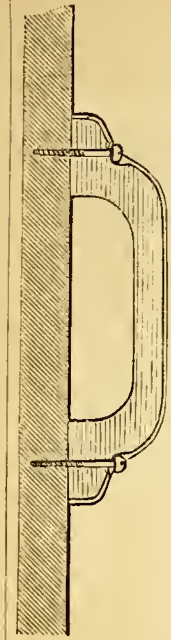


FIG. 9.—CATCH FOR COAL SCOOP.

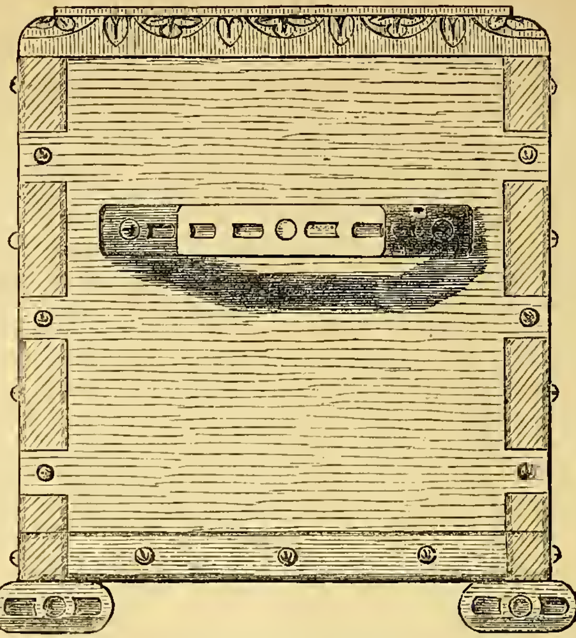


FIG. 8.—ELEVATION OF BACK.

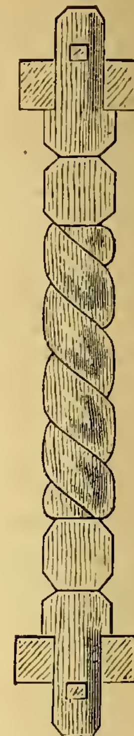


FIG. 10.—HANDLE OF COAL-SCUTTLE.

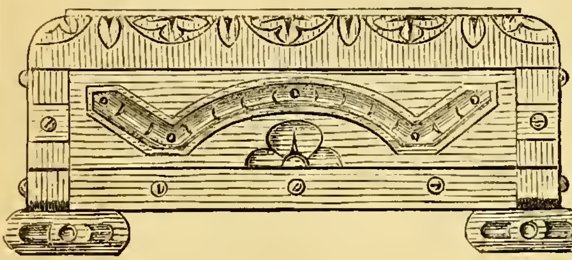


FIG. 7.—ELEVATION OF FRONT.

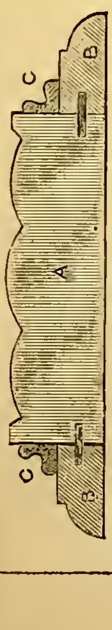


FIG. 12.—SECTION OF LID.

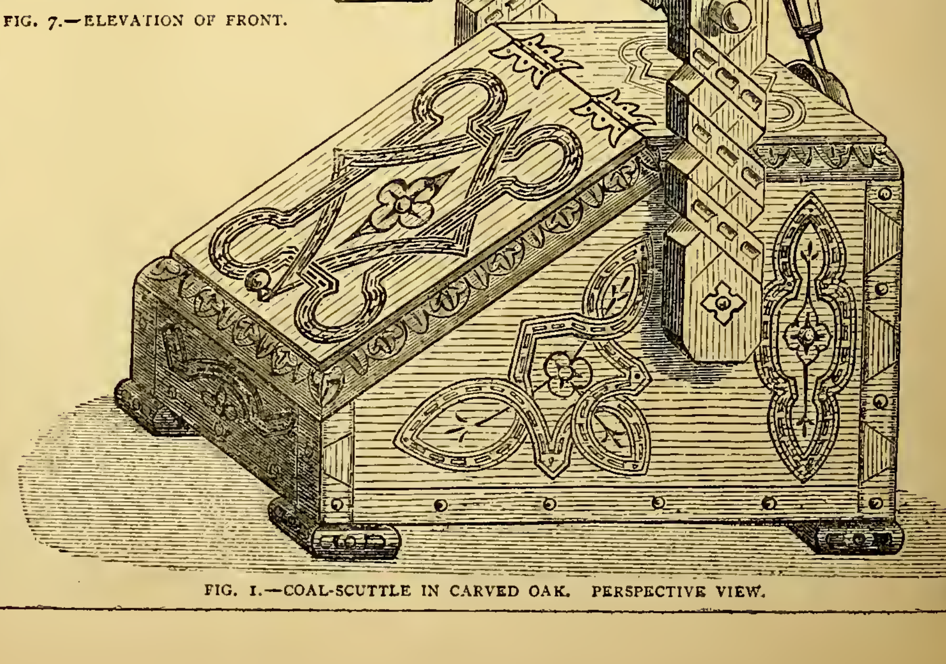


FIG. 1.—COAL-SCUTTLE IN CARVED OAK. PERSPECTIVE VIEW.

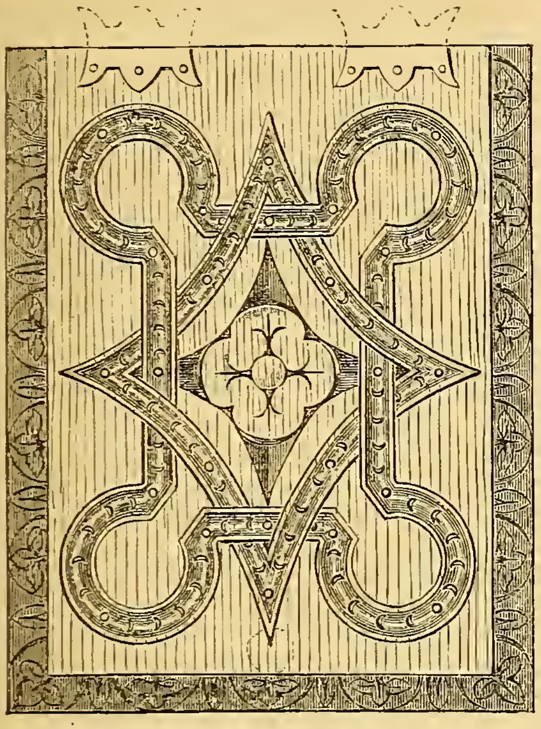


FIG. 2.—PLAN, ETC., OF LID.

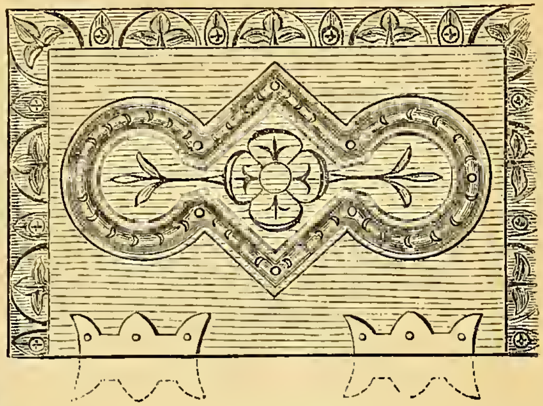


FIG. 3.—PLAN OF TOP.

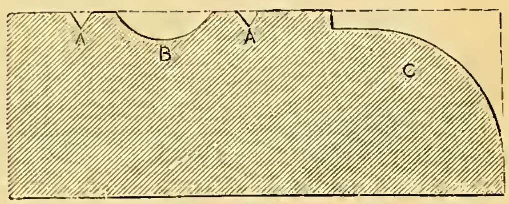


FIG. 4.—SECTION EXPLAINING DECORATION. FULL SIZE.

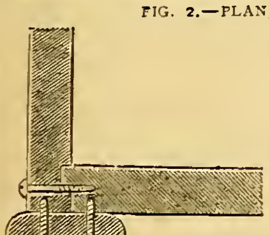


FIG. 6. — SECTION SHOWING HOW THE PARTS ARE PUT TOGETHER.

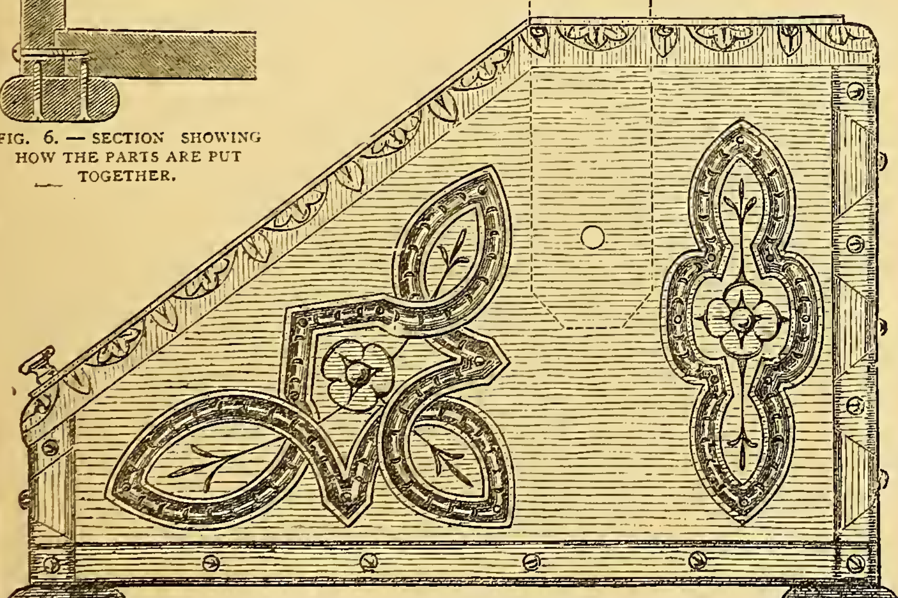


FIG. 5.—ELEVATION OF SIDE.

FIG. 11.—SUPPORT OF HANDLE.

$\frac{3}{4}$-inch stuff, $15\frac{1}{2}$ inches long. The central part is rounded, and cut to a twist. The ends are rounded down to 1 inch, to pass through the holes bored in the supports. Here they are secured, as shown, by square pegs driven from above. If the worker has a lathe, instead of the twist and the slight decoration carved on the supports (Fig. 11), he will probably substitute turning, which will be neater in effect.

It will be well that the pins on which the supports turn should be fitted with screws and nuts on the inside. If inch board is used for the sides, strong common screws, merely driven into the wood, might suffice ; but there would be danger of these working loose in time. The supports are made so long as to permit the handle to be turned quite down over the back of the scuttle, and so to let the lid be folded flat back on the top, whenever there may be occasion for so doing.

The correspondent above mentioned states that he has a carved panel, measuring $9\frac{1}{2}$ inches by 7 inches by 2 inches, of which he would wish to make use in the lid of his coal-scuttle. The dimensions are not quite well suited for the purpose, and it would scarcely be fair to other readers if I were to design an article exclusively to meet his requirements. I will, however, suggest two methods by which such a panel might be adapted to the plan before us.

If placing the panel with one of its ends lowermost will not spoil the effect of the carving, he has but to join to it a strip of inch wood, 2 inches wide, all round. In Fig. 12 A is the panel, and B B are the strips. A line of moulding laid on these, as at C C, will lead down from the thicker to the thinner wood, and form a sort of frame to the carved panel. If the old carving be good, this will undoubtedly make a very rich lid.

If, however, the design of the carving renders it necessary that it should be placed lengthwise, two broader strips, $3\frac{1}{2}$ inches wide, will have to be joined to the panel, above and below ; which will bring it from 7 inches to the required depth, which is 14. The length of the panel is $9\frac{1}{2}$ inches ; and three-fourths of an inch, the half of the difference between this and 11 inches, the width of the lid, will not allow space for a proper border. Under these circumstances, the better plan will be to make the scuttle generally wider by two inches than the dimensions laid down. It can be done with little difficulty. The quatrefoil carved on the top and the slight ornament on the front may both be elongated a little without injury. The two broad strips will require a little enrichment, which should harmonize with the carving of the central panel.

Unlike this correspondent, those who possess scraps of carved panel which might serve to decorate a coal-scuttle, will probably have them in thin board, too thin to have by themselves strength enough for the purpose. My plan with such scraps would be to make the box of plain board, and to fix the carved slips upon it with screws from within. This would be much more satisfactory than gluing them. The pieces can be planed down at the back to a uniform thickness, and a good effect may be got from odd scraps thus applied, if arranged with judgment.

Possibly the general dimensions given above may make a box too small for the requirements of some workers. I may therefore remind such persons that if, instead of one-fourth, they will regard the working drawings as one-fifth of the actual size, and enlarge them accordingly, they will have a scuttle $22\frac{1}{2}$ inches long. There are few rooms in which a larger size than this can be required.

Those who do their work partly in old and partly in new oak, and wish to make the whole harmonize in colour, I must refer for directions to my articles on the "Restoration of Antique Furniture," in Vol. I. In addition to the receipts there given, however, I have pleasure in inserting one kindly forwarded by that correspondent of whom I have before spoken. It is as follows : "Common soda, 2 lbs. ; burnt umber, 1 lb. Mix with three pints of water, and simmer till the mixture is reduced to a quart. Paint on with a brush, and when dry, brush the wood with a whalebone brush till polished; then apply naphtha varnish, thinned with methylated spirit; and, lastly, finish with beeswax and turpentine."

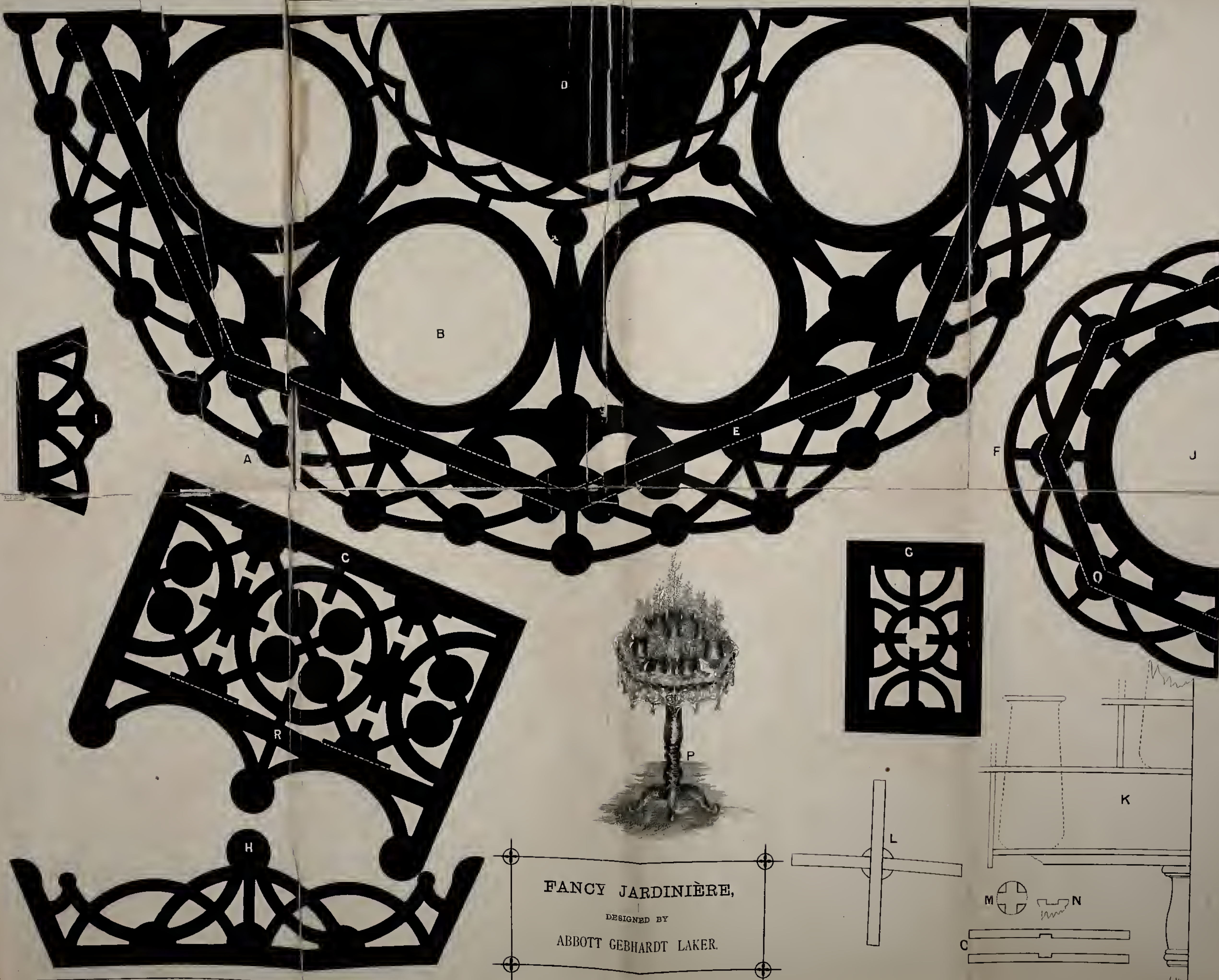
My correspondent pronounces this to be the best and cheapest method of colouring new oak to resemble old, that has come within his knowledge.

A FANCY JARDINIÈRE.

By ABBOTT GEBHARDT LAKER.

(For Illustrations, see the Supplement to this Part.)

FLOWERS are unquestionably appreciated by the majority, and it is for lovers of this fragile but beautiful branch of nature that we pen our remarks. Artificial flowers, thanks to the ingenuity of man, have arrived at a great state of perfection ; but these, although nice ornaments, are at their best but poor compared with nature, and lacks that which is most charming—life. Lovers of botany when among flowers are never without companions, and the science is one which embraces a wide field of interesting information. A thorough knowledge of flowers is certainly useful in various ways, and affords an acceptable subject for conversation, besides perhaps being of service to youthful couples wishing to correspond surreptitiously. Each flower has a significant meaning, and there are



FANCY JARDINIÈRE,

DESIGNED BY

ABBOTT GEBHARDT LAKER.

WARD, LOCK, & CO., WARWICK HOUSE, SALISBURY SQUARE, LONDON, E.C.

PT 23

Fancy Jardiniere

many which, when blended as a bouquet, are most beautiful, and convey terms of endearment which are perhaps, alone understood by the donor and recipient. There are many, perhaps, who would cultivate the study of flowers more generally if they had convenient receptacles for them, and could tend them with ease. Our illustration, while offering these advantages, is, at the same time, an additional and ornamental piece of furniture. The construction is intended to accommodate the holding of glasses for bulbs, such as hyacinths, tulips, narcissus, etc.; although, if preferred, cut flowers may be inserted in the coloured glasses and substituted. The advantages of a fancy jardinière on this principle are that, while a quantity of flowers can be tastefully arranged in a small space, they can be moved at pleasure without the slightest apprehension of their coming to grief, the glasses holding them being partially enclosed (B); and, still further, where young children are plentiful there will be less chance of a "spill." To the more cynical, the drawing may suggest the appearance of a novel liqueur-stand for those who require a very plentiful and frequent "stimulant"; but this suggestion must be obviously unfounded in these days of "Blue Ribbonism" and "Good Templarism," when such corrupt practices are without record.

The wood of which the jardinière is to be constructed must be left to the taste of the fret-cutter, but mahogany, sycamore, and walnut are three very suitable. The sycamore, certainly very attractive in appearance, is perhaps somewhat delicate in tint, and therefore troublesome to keep clean; while mahogany and walnut, which are darker in colour, are, perhaps, more advantageous in this respect to work. The thickness of the wood used should be about ½ inch slack. Our illustration (on account of limited space) only gives half of the design for top of ornament (A). The shape, as is readily seen, is octagonal, and the whole of top (19 inches in diameter) can be cut at once, if the halves are tacked together, fretted, then separated, planed, and fitted down centre. By this plan a great deal of labour will be saved, the general appearance enhanced, and the pattern throughout more correct. Fitting underneath (A), and cut to the same size and shape, is the bottom, which, not being seen, may be of deal, and connected to the top by pieces C. These parts, which may be screwed from the lines E downwards, and again secured to bottom at R, are eight in number, and must be cut and planed on the edges at an angle. The angular appearance of the design is relieved by a geometrical laced pattern, developing into a circular form. Immediately over lines E (if considered an improvement) the amateur can fit the lace-work borders, H, eight of which form a reclining enclosure. In the centre, as shown at D, a slight elevation is made, and a larger glass used. Here the glass rests upon the plain surface D, and is enclosed by eight pieces, G, which are surmounted by the fancy piece F (here also only half of design is given). Through J the glass is inserted, and upon the lines Q, if the lace pattern is used at E, a similar enclosure, I, must be made to correspond. Fig. K is a rough skeleton sketch of the general construction, and a glance first at this and then at the "miniature" (P) will unquestionably assist the amateur in comprehending the idea more easily than by wading through a long description. The object of having the raised centre is that the flowers may be above those in the glasses placed round, and the general flatness of aspect relieved. The design is of a geometrical type, and if care be taken in the cutting out, it will repay the labour bestowed, inasmuch as there are no points likely to break off, and the whole surface may be planed over, and can always be dusted with impunity.

The glasses for the bulbs can be purchased at any china warehouse at a very reasonable cost. The circles to receive same must be cut to the size of glasses purchased; those in the drawing need not be followed exactly. A pleasing effect may be obtained by a little judgment in the choice and blending of the colours of the glasses and flowers. Those parts fretted should be lined at the back with a suitable coloured cashmere. This, besides being an ornamentation, will hide the ends of the glasses otherwise seen, and "throw up" the effect of the fretwork.

The construction of the top having been successfully accomplished, attention should be turned to the pedestal upon which to mount it. Presumably, the amateur will not possess a lathe sufficiently large to turn anything so lengthy as a table leg; he can, however, purchase a nicely turned ornamental pedestal, with a tripod end, for about 2s. 6d. or 3s., which will cost, perhaps, another 6d. for staining or polishing. To connect the pedestal with the top, the following is a good plan:—Draw lines at right angles across the top of leg about 1½ inch apart, and sink these to depth of 1 inch; having cut these spaces, fit into them the cross pieces L. These are so placed (as shown in illustration) to form a substantial substructure. Figs. M, N, O represent the various constructions of the foregoing plan. In conclusion, screw from underneath supports L into the ½ inch deal bottom. This is not only the strongest plan, but avoids a disfigurement of the ornamental parts.

Sand-paper all those surfaces which are not quite smooth, then size and varnish; and, if these instructions are carefully attended to, the result will undoubtedly amply repay the labour bestowed, and satisfactorily meet all expectations.

A FEW WORDS ABOUT PIANOS.

By W. W. C.

III.—RUSTING OF STRINGS—CELESTE PEDAL.

IN the first paper of this series I noticed one effect of damp upon a pianoforte—viz., the swelling or warping of the keys or other parts of the instrument, and in the last paper I referred incidentally to another—the rusting of the strings. The latter may result in more trouble than the former, seeing that if allowed to continue to form, rust may eventually succeed in eating through the strings to the extent of so weakening them, that they cannot endure the strain, and snap. Therefore, when rust appears on the strings, not only should it be removed, but steps should, if practicable, be taken to prevent a further formation of it.

While writing thus positively, I am not unaware of the fact that a slight difference of opinion exists among manufacturers on the point, some of whom suggest that the rust may be left alone ; but, while I should be unwilling to insist that such advice must be given *con motivo*, I cannot but regard two powerful considerations as more than sufficient to prevent its adoption: and these are, that as the rust only forms at the expense of the steel, there is with increase of rust decrease of substance of the wire, and therefore, first, as all students of sound will unhesitatingly pronounce, with such decrease an inevitable decrease in the volume of sound ; and, second, the ultimate destruction of the wire.

Now, polishing steel is a very simple matter, and the rusting of strings might pass without special comment, but for this difference that, whereas any ordinary polished article which can be conveniently taken in hand and cleaned, may be readily ridded of its rust, or perhaps have its circumstances altered, the wires of a piano are not only not easy to thoroughly clean, but should be cleaned in a special way; and, moreover, the room in which the piano stands is, as a rule, the only one in which it can conveniently be put.

It may at once be seen whether the cause of the rust is dampness generally pervading the atmosphere of the room, or whether it is dampness merely rising from the floor. The latter is becoming of more frequent occurrence now that, particularly in the suburbs, builders more often than formerly build houses without basements, the joists supporting the ground-floor

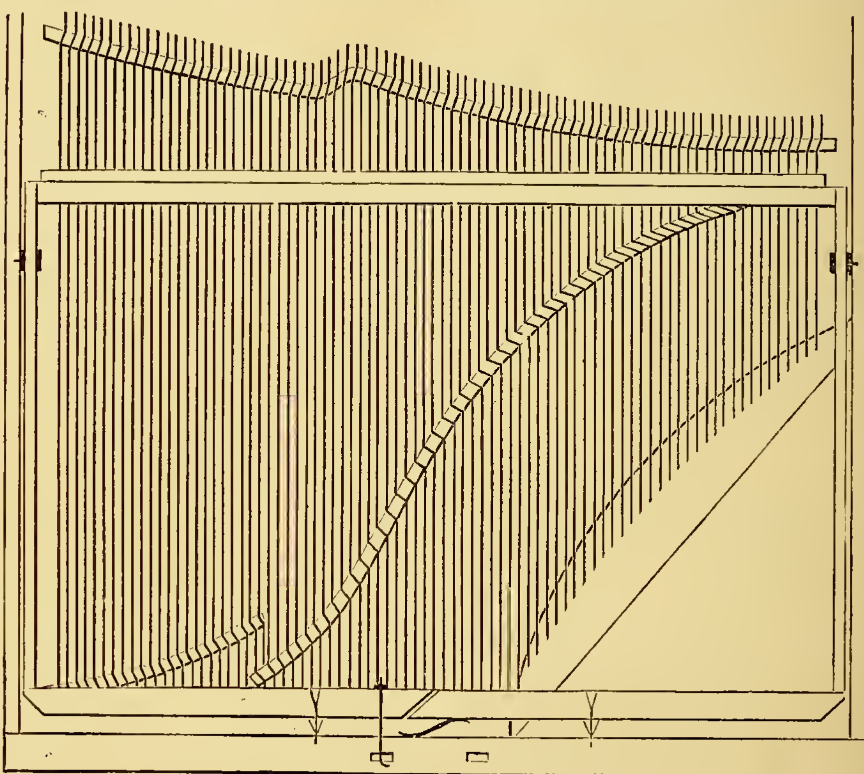


FIG. 3.—GENERAL VIEW OF A CELESTE DAMPER AND ACTION.

resting but a little way, if at all, above the ground. In the former case the wires will be equally affected in all parts, and not only they, but other parts also of the instrument will show symptoms of damp; in the latter the lowest portion of the strings is most affected, and the rust gradually decreases towards the upper half which—*i.e.*, the half above the keyboard—is usually free from rust.

The common mode of cleansing is rubbing with fine emery cloth, or emery powder and oil, which is employed by regular cleaners. The finest cloth is, however, too coarse as bought, and if used at all, the emery surfaces of two pieces should be rubbed together on a flat table, so as to reduce the roughness to a minimum. It has to be borne in mind, that while the primary object is the removal of the rust, a no less important one is the preservation of the steel; and, therefore, as in the

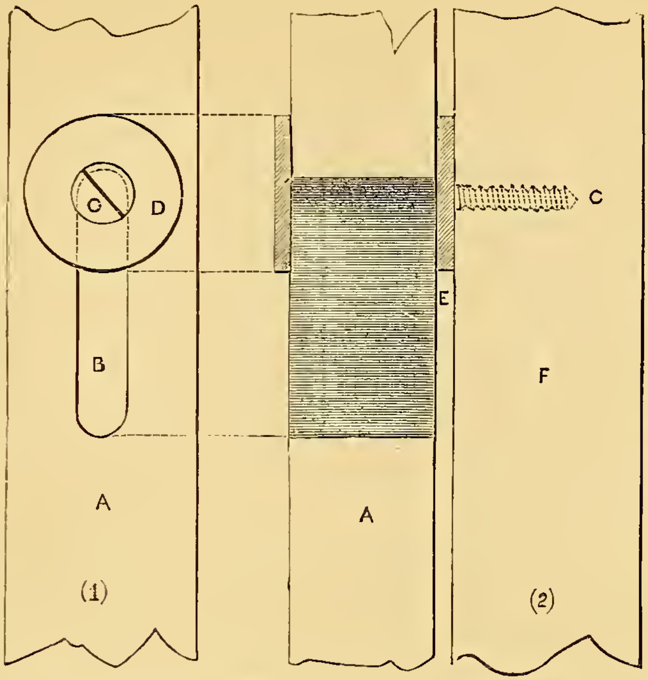


FIG. 7.—SLIDING ACTION FOR ROD. (1), ELEVATION; (2), SECTION. A, Rod; B, Slit; C, Screw; D, Washer between Screw and Rod; E, Washer between Rod and Walls of Piano; F, Wall of Piano.

case of brass instruments, the abrading material must not have more power than is just sufficient to effect the object. The rubbing with this fined emery cloth should be straight up and down, taking as great a length of string as possible, and should be done in such a way as that the cylindrical shape of the string is not unnecessarily impaired. This is secured by rubbing opposite parts of the string equally thus, ọ ·o· ọ ọ with powder, which should be emery flour, a piece of fine chamois leather should be used. A rather better substance than emery, though it takes longer to attain the end, is crocus powder, which may be had at the better oil-shops at about 2d. per ounce. It should be used with oil and a piece of soft flannel, or chamois. It is an oxide of iron, and the only thing against it—a particularly important one in this connection—is, that it is hygro-

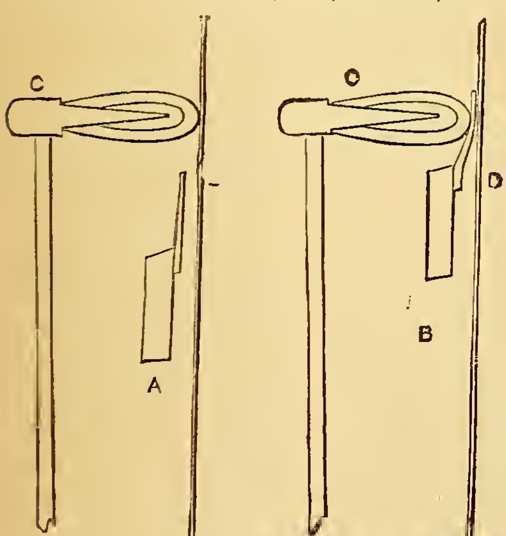


FIG. 9.—DIAGRAM SHOWING WAY IN WHICH CELESTE DAMPER ACTS. A, Pedal not in use; B, Pedal down; C, Hammer; D, String.

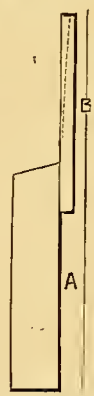


FIG. 6.—SECTION OF DAMPER. A, Lath. B, Felt.

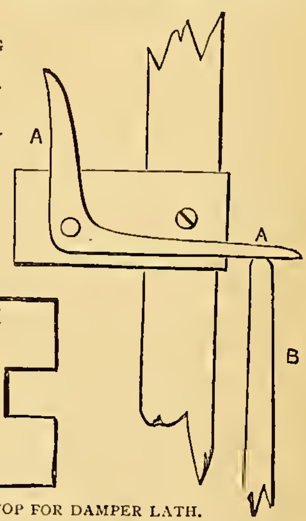


FIG. 8.—SHIFTING ACTION LEVER SEEN FROM BACK. A, Lever. B, Rod from Pedal Levers.

FIG. 5.—ROD, NOTCHED AT TOP FOR DAMPER LATH.

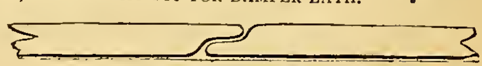


FIG. 4.—IMPROVED PEDAL JOINT.

scopic. Care must therefore be taken that every particle is removed from the string, and that before use it is thoroughly dried by heating either in the oven or in an iron spoon over the fire. It should go without saying that the rust be quite removed, not only from the wires, but also from their neighbourhood—to wit, the floor of the piano.

Prevention of Rust.—I have dealt with the cleaning the strings next after the mention of the evil, because the sequence seemed so natural, but in practice it will be well to deal with the cause of the rust before attacking the rust itself. As in diseases brought about or prejudicially affected by permanent conditions, if the rust is caused by regular dampness of air, the only remedy is change—viz., from one room to another, or from a lower to a higher floor; and if this is impracticable, or a dry atmosphere cannot be provided, there is no cure, and as fast as rust may be removed, more will form. But if the dampness only rises from beneath the boards, the remedy is easy. I the floor is very near the earth, of course an improvement would follow on the removal of a few cartloads of earth, and proper ventilation of the intervening space. Premising, however, that it is not intended to incur this trouble and expense, there is another plan: All floor boards should be grooved and tongued; but they are not often so, even in houses of fair rental. Mostly they are laid unseasoned, and edge to edge, and when dry gape. To counteract these defects, make thin slips which will perfectly fill these openings, glue their sides with thin hot glue, drive them well in, and plane down. The portion of floor thus treated should extend a foot beyond the piano in each open direction. Similarly treat any space between the floor and skirting-board. Then cover the whole with two good coats of linseed-oil varnish. If this is well done, no damp will rise. But, to make assurance doubly sure, sew together two large sheets of brown paper, giving a lap of about an inch; thoroughly but slowly dry them, so as not to warp them, and varnish on both sides. All this must be done in dry weather, as brown paper absorbs moisture. When dry, the united sheet will be laid over the prepared flooring. Relay the carpet and replace the piano, and the boards will be proof against the rising of damp.

There is another source of damp—viz., a damp wall. Here the cause will most probably be the absence of a damp course; and the readiest way of meeting this difficulty is removing the plaster on the wall, and replacing it with some impervious cement. The piano should in this case stand at some little distance from the wall.

I will now deal with the second matter, upon which, in the last paper, I promised to say a few words—viz., the Celeste pedal.

The ordinary action by which is obtained a softening of the tone beyond and different in quality from that arrived at by playing as softly as possible, is known as the shifting action, and the result is brought about by the moving slightly to the right of the upper ends of the stickers (*i.e.*, the upright rods which spring from the inner ends of the keys, and communicate motion to the hammers), so that, instead of playing upon two wires when a key is struck, the hammers, when the soft pedal is down, only strike one; and similarly, instead of striking three strings in the trichord portion, they strike only two.

This shifting action is now in many pianos of a better class, being replaced by one which has obtained very large and high favour—viz., the "Celeste." I do not wish to convey the impression that everyone who has tried the Celeste pedal has immediately become enamoured of it. The fact is, that the latter produces quite a different kind of effect from that got with the former. If it were the case that the Celeste supplies deficiencies attending the use of the shifting movement while retaining its advantages, there could be no hesitation in advocating its immediate substitution; but, as in all cases where there is a different aim, the adoption of it must be quite a matter for decision, according to individual predilections. To my mind, however, the Celeste is greatly superior. Where the shifting action is applied there is no gradation in volume or quality of tone between the softest sound of the natural piano and the sound when the pedal is down; but there is necessarily, from the sudden break from two strings to only one, as sudden a decrease and difference in the tone. There is no bridging over this break—no medium between the whole and half or whole and two-thirds, as the case may be. It is exactly this defect—and as a defect I certainly regard it—that the Celeste meets and supplies, by dispensing with the sidelong movement of the stickers, and, instead, introducing between the hammers and the strings a strip of soft felt, so that the hammers strike the wires with the felt intervening, as shown in Fig. 9.

In this matter, which is altogether one of taste and feeling, it will be proper *audire alteram partem.* Those who favour the old plan claim that by it one gets a beautiful harp-like tone, and decry the Celeste as having a muffled tone. *Præterea nihil*—the reply of the "Celestials" is clear and decisive: part has just been indicated. Granting, for the sake of argument, the similarity between the sound of a single string struck and that of another plucked—a similarity which is not perfect—there is no getting over this fact, that with the old action there is no option between all harp and all piano. With the Celeste the instrument remains a piano; and with the slight modification

which I suggest, one can get the most perfect crescendo and diminuendo between the very loudest and the scarcely audible so perfect, indeed, that only the most experienced could detect when the action comes into play. As to the muffled tone, *chacun à son goût.* It is at least as clear as the harp. Further than this, and not ignoring the fact that the soft pedal only properly comes into operation in soft movements, we all know that "harping on one string" does lead to discord. The strings are unequally used; the pitch of one alters more than that of another; and we have the family jars. But in the Celeste there is no partial playing—all the strings are used as before. And, lastly, the lowest notes are, by the old plan, only softened to the extent that the wires are struck with the side of the hammer-edge instead of by the full front, whereas, in the Celeste, the hammers not being shifted, continue to strike with full face.

On removing the upper and lower panels and the action frame, and supposing the remaining fixed part and the right-hand pedal lever removed, we have only the back, body, strings, and soft pedal lever left. At the back of the action frame there runs a strong board, which keeps the stickers and hammers in position. This is kept firm by a strong spring at the right-hand end, and at the left-hand end will be found a lever which, viewed from the back, appears as in Fig. 8. The lower left end of this lever rests on the upper end of the upright rod which springs from the side end of the pedal lever, while the upper end of it fits into a notch cut in the board. When the pedal is depressed, the rod is raised, and the board is pressed sideways. With the Celeste this square lever is no longer required. It only needs to be unscrewed to be removed. Fig. 3 shows the interior of the instrument as fitted with the Celeste pedal. From this it will be seen that two pedal levers are required in order to support and work the two side-rods that carry the lath to which is attached the felt. The plan and cuts, I think, speak for themselves, but a word or two of description may be useful.

The one pedal has to draw down both levers, so that the division between them must be shaped accordingly. That shown in Fig. 3 is very commonly met with; but it has this disadvantage, that it often requires great pressure to obtain the full use of the lath. The division shown in Fig. 4 is very much better. The ends where friction occurs are covered with baize, and then rubbed with soap, such as yellow soap, *not* grease. Cottage pianos vary much in width and height, therefore particular dimensions are not of much use, but generally the height of the side-rods is determined by the height of the hammers. The damping felt is 1 in. wide at the treble end to $1\frac{1}{3}$ in. at the bass end, and $1\frac{1}{4}$ in. is glued on to the lath. The length of the felt is just a trifle over what is sufficient to cover the wires. The lath is $1\frac{1}{4}$ in. deep and $\frac{1}{4}$ in. thick, and fits into a slot at the upper end of each side-rod, so that the top edge of the lath is level with the end of the rod. The side-rods rest on the extreme ends of the pedal levers, to which they are attached by leather hinges; and the mode of attachment will best be observed from the existing side-rod, which will be too short for use. These rods must run up quite close to the side-walls of the piano, and their length will be such that the upper edge of the felt will rest ordinarily 1 in below the line on which the hammers strike the strings. At about 6 in. down a mortise is cut in each rod, and this works on a $1\frac{1}{2}$ in. screw, driven into the side-wall. The length of the mortise is such, that when the pedal is down, and the rods raised, the felt will cover the line on which the hammers strike the strings. A small circular felt washer lies between the rod and the wall, and another between the rod and the head of the screw.

A strong band spring attached to the under side of the right lever, and acting on the floor of the piano, completes the mechanism.

BRAZING AND SOLDERING.

By GEORGE EDWINSON.

VI.—AUTOGENOUS SOLDERING OR WELDING.

THE process of autogenous soldering or welding is strictly limited to those few metals which are capable of giving up parts of themselves to act as solder when subjected to suitable conditions, without causing disruption of their mass. The process is termed autogenous, because the solder is self-produced —that is, produced by the metal we wish to unite. We have already seen that certain alloys can be united by other alloys of similar composition as regards the metals in the alloy, and varying only in their proportions; but masses of such metals as tin, zinc, copper, silver, and gold cannot be united by melting thin strips of the same metals on their edges, nor can the thinned edges themselves be melted together without causing a disruption of the edges or of the whole mass. I speak now, of course, from a practical, not a theoretical point of view, for theoretically it is possible to weld silver, copper, and gold, and persons claim to have successfully performed experiments in welding those metals, but, although I have myself obtained something like success in such experiments, the results were not satisfactory to me, because I have not been able to secure a strong joint by welding such metals together in their pure state. Copper rapidly oxidizes when heated up to and above

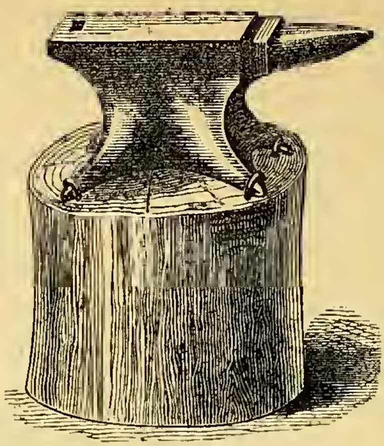


FIG. 4[illegible].—SMITH'S ANVIL AND BLOCK.

a red heat in air, and its oxide prevents the unity of the two masses of metal. Attempts have been made to prevent oxidation by dipping the cleaned parts in soap ley (obtainable from soap boilers), and then heating up on and under charcoal with a blow-pipe flame. I have partially succeeded by rolling the cleaned parts in a flux of carbonate of soda paste, bedding the joint in charcoal, and acting on it with a very full coal-gas flame from a blow-pipe urged by a foot blower. The joint thus obtained was firm, but not neat. There appears to be no welding heat for silver and gold, as in heating they pass rapidly into a molten state, and break up in drops before the heating process can be arrested.

We may, therefore, limit the practice of autogenous soldering to iron, platinum, and lead. Few persons will have the good fortune to possess broken articles made of platinum, but to those few who may desire to mend them I may say that cleaned small pieces of platinum may be welded together when heated to a bright red heat. A little salt of antimony on the joint will assist in more speedily promoting union of the parts by forming an alloy with platinum, and the excess of antimony may be driven off by heating the joint to whiteness.

The practice of autogenous soldering or welding of iron is widely known, and there are few towns or villages in which the blacksmith's forge cannot be found. This being the case, readers who may wish to learn how to weld iron will do well to visit the village blacksmith and observe his mode of working. The requisite tools are—a forge, with bellows to give a constant blast of wind, one or two, or more, pairs of tongs, a hand-hammer (Fig. 47) weighing about a pound, or a little over this weight, and a swage, or two, if more than one shaped section of iron has to be welded.

On paying a visit to a village smithy it will be observed that the forge is built of brick or stone, and the hearth iron-bound; it is, therefore, a permanent structure, and one unlikely to be imitated by the amateur. He will require a portable forge, such as those in use by bridge-builders and boiler-makers. Small forges with bellows beneath the hearth, and others worked by a small fan driven by hand, are obtainable through most tool vendors, or may sometimes be picked up at second-hand tool shops. Messrs. Rawson, Drew, and Co., 225, *Upper Thames Street*, *London*, are vendors of a superior hand-blower portable forge, made to work by wheel, treadle, or lever. The following are the prices, and I do not think that any amateur will consider them excessive when the handiness is taken into account:

No.	Size of Hearth.	Price. £ s. d.	Hoods, for in-door use, extra. £ s. d.
1	24 inches by 18	4 10 0	0 15 0
2	30 " 22	5 10 0	0 17 6
3	34 " 26	7 0 0	1 2 6

Mr. Fletcher, of *Museum Street*, *Warrington*, also supplies a neat little outfit for an amateur as follows:—

	£	s.	d.
Strong double bellows blower ...	1	15	0
Large blowpipe	0	7	0
Hearth, tongs, shovel, two pokers	1	0	0
6 ft. India-rubber tubing	0	4	0
	£3	6	0

This outfit may be used for forging tools, heating small iron work for welding, or may be used to heat up work for brazing. The size of the hearth is 15 by 18 inches, and coal or coke may be burnt on it, or gas may be burnt with the latter, the blowpipe being adapted for that purpose. If the forge is to be used indoors it must be provided with a hood, and this will cost 6s. extra. The flue from this hood should be carried into a chimney with a good draught to take up all the smoke and fumes. The double bellows apparatus mentioned in my last article, may be used with this hearth, and, if coal gas is not available, the vapour from the petroleum gas generator may be used with coke instead of gas.

The anvil usually found in a smith's forge will be

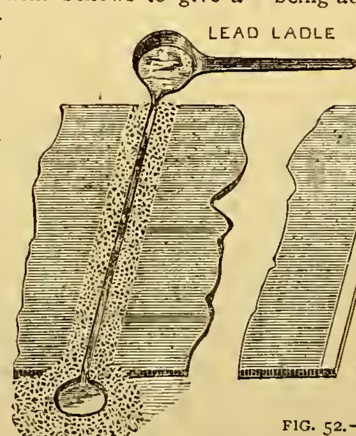


FIG. 51.—DISPOSAL OF JOINT FOR LEAD BURNING.

FIG. 52.—SHAVE-HOOK.

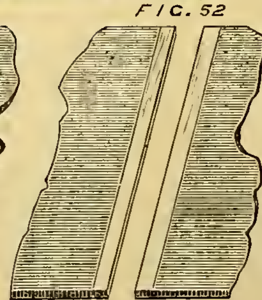
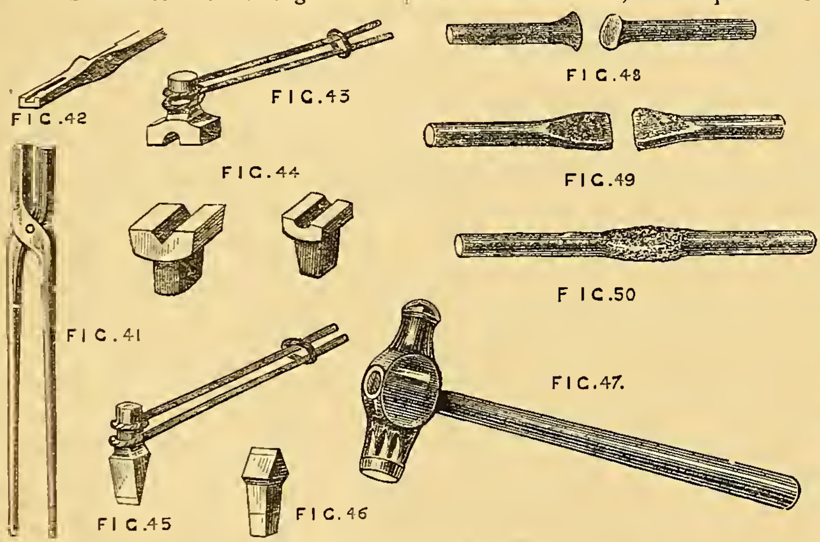


FIG. 53.—LEAD JOINT SHAVED FOR BURNING.

seen to be too heavy for the amateur, but smaller anvils can be obtained, as they are made in different sizes and weights, from 28 lbs. and upwards. The price is generally fixed at so much per pound, according to the make and finish of the anvil, the usual prices ranging from 5d. to 7d. per pound ; but tools at a less price per pound can sometimes be picked up at a marine-store dealer's or a second-hand tool shop.

The anvil must be firmly fixed on a heavy block of wood, to raise it to the required height, and this block is usually bedded in the floor, or secured to it by iron clamps. If the anvil is bedded in sand or in sawdust, the sound of the blows will be much deadened thereby. The stump of a tree will make an excellent block. This should be cut to such a length as to bring the top or surface of the anvil to the hips of the workman. Some persons like it lower than this, and others higher; but this has been found to be a convenient height for light work. The surface of the top of the block should be broad enough for the base of the anvil ; and this must be secured to the block by staples, or strong iron hooks, driven into the block, as shown in Fig. 40. The position of the anvil in the forge should be about 2 ft. from the side of the hearth and 2 ft. from the *tuyère*, with the point, or nose, or "beck," pointing to the left or right, to suit the hand of the workman. A hole will be observed in the left-hand side of the anvil. This is for the tangs of the swages (Figs. 43 and 44), useful tools for shaping the iron after it has been welded. They are made in various sizes, and with grooves of a size and shape to suit the work in hand. Both top and bottom swages are used in finishing weldings, the top swage being held in an iron or twisted hazel handle, whilst an assistant strikes it with a heavy hammer. A hard chisel, or "sett" (Figs. 45 and 46) is also made to fit in the swage hole ; and this will be found useful for nicking across pieces of hot iron.



TOOLS USED IN SMITH'S WORK.

Fig. 41.—Smith's Tongs. Fig. 42.—Jaw of Tongs. Fig. 43.—Top Swage. Fig. 44.—Bottom Swages. Fig. 45.—Top Hard Chisel or Sett. Fig. 46.—Bottom Hard Chisel. Fig. 47.—Smith's Hammer. Fig. 48.—Ends of Iron Bars Dumped. Fig. 49.—Ends of Bars Scarfed. Fig. 50.—Welded Joint before Swaging.

The tongs observed in a well-appointed smith's shop are many and various ; but for most of the purposes of welding coming within the province of an amateur, two pairs of the following size will be found sufficient : Jaws, 3 in. long by $1\frac{1}{4}$ in. in width, by $\frac{3}{4}$ in. thick, with $\frac{1}{2}$ in. to $\frac{5}{8}$ in. groove in width, and $\frac{3}{8}$ in. depth, running lengthwise through centre of jaws ; handles, 18 in. long, of $\frac{1}{2}$ in. iron. Figs. 41 and 42 will show form of tongs.

In some makes of portable forges, a small iron trough is included, to hold the water needed in all smithing operations for damping the fire and cooling the tools and iron ; but a pailful of water will do equally well, although not so handy for the purpose.

The ordinary fuel used is that of slack or smith's small coal. This should be free from brassy pieces and from stones, for the brassy specks contain sulphur, and this ruins iron and steel, making them brittle and difficult to weld and work. The fire must be kept scrupulously clean of clinker and metal, scales of iron, and dirt of all kinds. Avoid heating soldering-irons in the fire intended for welding, and strictly taboo all melting of brass, zinc, tin, or solder in the forge fire, and also beware of galvanized iron.

The joint most in general use for iron and steel, when these have to be welded, is the lap-joint shown in sketch, although occasions will arise where a butt-joint is necessary ; but these are difficult, and should not be attempted by amateurs. We will therefore take for illustration a simple bar of iron broken in the middle, and proceed to mend it. Heat up the two pieces to a white heat in the fire, take each out, and "dump" or upset them, hot end downward, on the anvil face, to cause the appearance shown in Fig. 48 ; then "scarf" the dumped ends with the hammer, to

the shape shown (Fig. 49), and return the pieces to the fire. The object of dumping or upsetting is to cause the iron to thicken at the joint, and thus make material to swage down to shape after the joint is made. If the ends are not dumped, the joint will be too thin to swage until it has been thickened by dumping the whole bar of iron. In scarfing, the ends are thinned to lap one over the other, and thus present large surfaces of iron to the welding process. Turn the pieces frequently in the fire, to expose them to equal heat, and, when both have passed from a white to a dazzling white heat, and have commenced to fizz or spit out sparks of burning metal, take them quickly from the fire, hand one piece to an assistant, direct him to lay the scarfed burning end on the anvil, and hold it there. Take the other piece in your left hand, place the scarfed end on that being held on the anvil; smartly, but lightly, tap the hot iron with the hammer on the top of the pieces over the intended joint, then once or twice on each side, and return to the fire together. Heat up again to a white heat, and this time well hammer the joint to make it round, and turn it frequently on the anvil; it will then probably assume the form shown in Fig. 50. If we wish to make the joint round or square and smooth like the rest of the bar, we must resort to the use of swages. These are blocks of iron grooved to certain sizes, round or cornered; one block is fixed in the anvil, the hot iron is laid in the groove, the other block, or top swage, of corresponding size and pattern, is held by the smith on the top of the iron; an assistant strikes the top swage with a heavy hammer or sledge, whilst the smith moves it over the iron, and turns this in the bottom swage. Thus the bar is heated and swaged, until the joint is round, and nearly as smooth as the rest of the bar. When thus finished, we shall find the bar a little shorter than it was before it was broken. This is due to the iron burnt away during the operation of welding, and, although to a certain extent unavoidable, it should teach us to be careful not to heat the iron more times than necessary—not to overheat it, and to waste no time in the process, but strike whilst the iron is hot. If the amateur has no assistant, he may punch holes in the scarfed ends, rivet them together with iron rivets, heat up to welding heat, and weld rivets into the joint. He must also dispense with a top swage, and finish off the joint on the bottom swage alone. Hazel handles are more comfortable than iron ones, because the iron jars the hand; and seasoned hazel sticks, ½ in. in diameter, are easily twisted in the middle, and wound around the neck of the swage, the two ends being held together in an iron link. A boy's iron hoop will give some good practice in welding, for a man must be smart to properly weld a little article such as this.

To weld iron to steel successfully requires a slight modification of the above process. The steel must only be heated to a bright red and hammered in that condition to scarf it. In heating up iron and steel to a welding heat in the same fire, particular attention must be given to the heat of the steel to avoid overheating. It should be mentioned here that steel is an alloy of carbon with iron, that this alloy will melt at a lower temperature than iron, and that the carbon will burn out of the steel at less than the welding heat of iron, leaving that metal in a porous and rotten condition. We must therefore keep the steel at a lower temperature than the iron, and be careful to avoid heating it above a creamy yellow. How can we do this in the same fire? By simply protecting the heated end of the steel with a substance that will prevent burning out of the carbon. This substance may be silica in the form of silicated sand, or calcium in the form of its crystallized carbonate. Procure, then, some silver sand or any other flinty sand, or instead of it some powdered limestone or powdered marble, and sprinkle the heating steel with this every time it begins to show a tendency to get above the creamy white heat, and until the iron is hot enough to be welded. Then snatch the steel from the fire, smartly brush the silicated coating off with a bunch of twigs and weld up at once to the iron as before directed for iron.

Cast steel articles may be welded together by paying attention to the foregoing remarks concerning steel and employing a sufficiency of powdered limestone or marble as a flux whilst heating the steel to a welding heat. Remember that the welding heat of steel is a creamy yellow, and that the coat of flux must be brushed from the joint before it is struck with the hammer; success will then follow in welding all kinds of steel.

In working a fire for welding iron it will be noticed that the fire will show a tendency to spread beyond the required area of the operation. Confine it to the proper area by sprinkling the bed of ashes around it with water. The fire will also get dirty from an accumulation of iron scale, ashes, impurities in the coal, and the flux above mentioned. These will collect as clinkers below the *tuyère*, and must be occasionally pulled out with the bent point of the poker or cleared out with the shovel, and a fresh supply added to the fire. When the bars to be welded are long enough to be grasped by the hand without the aid of tongs, the ends to be grasped are kept cool with water, and tongs are dispensed with. Leather aprons are employed by smiths as a protection to their clothing against the sparks of the fizzing iron, but the amateur may provide himself with a substitute, in a sail-canvas apron soaked in a solution of alum and allowed to dry.

Autogenous Soldering of Lead.—This process possesses a peculiar fascination over the minds of amateur metal workers, but is at the same time one of those processes which must be rightly placed beyond their province, for it is most difficult to learn, and its performance is always attended with an element of danger. I shall therefore merely give a brief sketch of the process, by way of making this series of papers complete. The tools required will be a wood mallet, a shave hook (Fig. 52), an apparatus for generating hydrogen gas, a blowpipe and foot blower, and some lengths of india-rubber pipe. The lead joints are first shaved clean, then beaten close together with the mallet, allowing a lap of $\frac{1}{4}$ inch, then acted upon by the blowpipe flame, fed with a mixture of hydrogen gas and air, until the lead edges melt and unite together. Hydrogen is generated in the apparatus by dilute sulphuric acid acting on fragments of zinc, and the gas thus produced is delivered under pressure to the blowpipe. The danger consists in a liability (through ignorance) of getting an explosive mixture of hydrogen and air in the generator, and firing this by a backward rush of flame from the blowpipe. The difficulty in using the apparatus consists in adjusting the air pressure from the blower to the pressure of hydrogen from the generator, and in applying the blowpipe flame to the lead in such a manner as to melt the edges alone and cause them to unite. Nothing but practical tuition under a first-class workman will enable any aspirant to practise this art.

Lead united by autogenous soldering has several advantages over lead joints made by the ordinary methods of soft soldering. Apart from the value of such joints in lead vessels used for the storage of acids in chemical works, autogenous joints are stronger than those soldered with soft solders. Soft-soldered lead joints are liable to disruption from extreme changes of temperature, from galvanic action in acidulated and mineral waters, and from acid vapours. I often experience inconvenience from soft soldered joints exposed to the acid vapours arising from galvanic batteries; those vapours attack the tin in soft solder, and render it soft as putty. This inconvenience could be met by autogenous soldering where lead connections are used, or joints made as in some forms of storage cells.

A method of autogenous soldering technically known as "burning" is sometimes resorted to where the form of the joint will admit of the process being employed. We will suppose the joint to be a seam on one side of a cylindrical lead vessel; we then proceed as follows: Well scrape the edges of the seam until quite a quarter of an inch from each edge is made bright (Fig. 53). Overlap those bright edges and bed the cylinder in sand on an inclined plane, to allow the molten lead used in the process to run freely down the seam, and yet not so freely as to run down swiftly. It will be well to poise this plane in such a manner as to admit of its adjustment to any incline, or to be placed level in finishing the runner. The cylinder must have its outside bedded in the sand, and enough of this material must be heaped up on each side to keep the cylinder firm. But before we thus bed it we must fix the laps securely by pasting one or two thicknesses of strong brown paper over the seam on the outside to the width of two or three inches; also paste two strips of brown paper one inch wide along the seam on the inside, allowing $\frac{3}{8}$ inch between two strips on the edge of the inside lap. This paper will prevent the sand from sticking to the hot lead. When the paper is dry, bed the cylinder as above directed, and proceed to form the runner on the inside of the seam. This "runner" is a channel for the hot lead to run in along the seam. To form the runner, take a straight smooth lath $\frac{3}{8}$ inch thick and $\frac{3}{4}$ inch wide, the length of the cylinder, and lay this along by the inner edge of the seam on the clean lead between the strips of paper, with one of its edges uppermost. Now bed the lath firmly in this position with moulding sand (Fig. 51), and bank up the sand on each side to the width of three inches. When this has been done, withdraw the lath and leave a clear channel free from sand straight along the seam; into this dust a little finely-powdered resin. Next prepare a pond with sand or clay at the bottom of the runner to receive the molten lead, and then proceed to melt several pounds' weight of lead in a spouted iron ladle. Continue the heat until the lead is not only all melted, but also appears red hot in the dark or above the melting point of lead; then proceed at once to pour it down the runner. The superfluous metal will collect in the pond below. Pour steadily for a moment or two, then feel the seam at the bottom of the runner with a smooth lath; if the seam feels rough, continue the stream of molten metal; if smooth, the seam is hot enough.

The lower end of the runner must now be stopped with a plug of clay, and filled with the molten metal, and as this shrinks pour on some more, until the runner is filled to the top, then allow it to cool. The red-hot lead will partly melt the edges of the seam, and these will unite with the molten lead to form a firm joint. When the joint is cool the sand must be cleared away, the lead runner inside cut away with a sharp chisel and trimmed smooth, and on removing the paper from the outside it will be seen that the lead has penetrated through just enough to fill up the lap and leave a neat joint.

The above is a brief outline of the process as applied to one job, and sufficiently illustrates the prin-

ciples underlying the process. These principles may be applied to other jobs; arrangements being made—1st, to well clean the edges of the joint by scraping them bright; 2nd, to secure them firmly together on the outside by pasting strong paper over them; 3rd, to bed the article firmly in sand in such a manner as to allow the hot lead to run down the seam into a pond below; 4th, to form a clean runner along the seam; 5th, to have the melted lead red hot at the time of pouring, and to pour it along the runner until the seam is melted smooth; then, 6th, to stop the molten metal from running into the pond, and fill up the runner with metal.

This series of articles on "Brazing and Soldering" is now completed. In them I have sought to lead my readers along by instructions illustrating the principles underlying the various processes, rather than by giving detailed directions for doing certain named jobs. I have to thank correspondents for sundry useful hints given from time to time, and also for words of encouragement. If I have omitted to mention the use of any material or soldering appliance, it is either because I have not tried it myself, or do not know of any person who has tried it, or I have mentioned some other more simple and effective. This applies specially to the complaints respecting an omission on my part to mention "Baker's Soldering Fluid." I do not know it, and think it cannot be procured as easily as a chloride of zinc solution, since this can be made by the amateur himself.

WOOD CARVING FOR AMATEURS.

By LEO PARSEY.

VI.—EBONY CARVING.

I PROPOSE in this paper to treat chiefly of small ebony work, and to give a description of some of the extra tools required for this kind of work by the amateur wood carver. I also intend giving a few designs suitable for brooches, earrings, and bracelets, which when carved in ebony will bear a very strong resemblance to the so-called bog oak jewellery.

Ebony wood can be obtained from any dealer in fancy woods, and I dare say Harger Brothers, *Settle, Yorkshire*, would supply it at a reasonable price. This wood is generally sold by weight, and I have frequently paid as much as a shilling per pound for it. It can be obtained either in blocks, or planed to any given thickness, and for carving purposes it will be better to obtain it planed to the required thickness. Thanks to the new postal regulations, it will be possible to get the wood sent by parcels post for a small sum.

For ebony carving the amateur requires smaller and more delicate tools than for the style of work I have previously described. There are two ways of getting these tools—either by making them, or by procuring them ready made. Until very lately I have made what small tools I required myself, but unless one has every appliance, it is but a thankless job. It was, however, a case of necessity with me, as although I had applied to several manufacturers of edge tools, none would undertake the job unless I gave an order for several dozen.

My method of procedure was to get some steel wire, or packing or sail-cloth needles, heat them in the gas, and with the aid of a hammer and two or three files work them into the necessary shape, and afterwards harden and sharpen them. I found it difficult in many cases, however, to get the proper degree of hardness, as the tempering of tools is a delicate operation.

To make tools properly requires a considerable amount of patience and practice, so I think in the majority of cases, the amateur will do better by writing or calling on Mr. A. S. Lunt, 297, *Hackney Road, E.*, and give him a sketch of the size and shape of the tools required. Mr. Lunt recently made some small carving tools to my written order, and it is but justice to state that they proved most satisfactory both for temper and shape, whilst the price was most moderate; as far as I can remember, I only paid at the rate of sixpence each, and the tools were handled as well. Tools for ebony carving require to be of good temper, otherwise if they are too hard they will notch or snap, and if too soft the edge will turn, and clean cutting is rendered impossible.

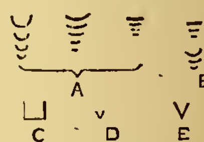


FIG. 34.—CARVING TOOLS FOR EBONY WORK ACTUAL SIZE. A, Straight Tools; B, Bent Tools; C, Maccaroni; D, Veiner; E, Parting Tool.

With these small tools, which are, of course, not intended to be used with a mallet for "roughing in" purposes, but simply for finishing off delicate work, shoulders are not necessary. The whole length of the tool should be about 4 inches, being 1 inch inserted into the handle, which should be of small size, and about 4 inches in length. The handles should be small in diameter, and of nearly the same thickness, and either plain turned or octagonal.

It will also be found more convenient to have the handles of different colours or shapes, so that they may be readily distinguished the one from the other, as owing to the slight variation in the size of the tools it is not so easy to pick up the one required by looking at the tool itself. I have given in Fig. 34

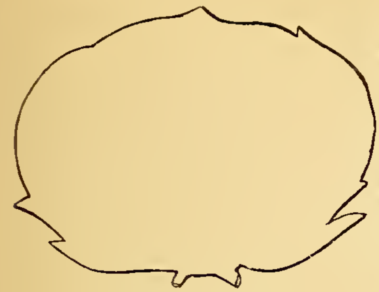


FIG. 36.—OUTLINE OF FIG. 35 FOR FRET CUTTING.

sketches of the sizes and sweeps of a few of the tools that will be found most useful, but in addition a very small parting or V tool, and the smallest obtainable veiner, will be required. The veiner cannot possibly be too small, as if a large veiner is used it gives a coarse appearance to the veins of the foliage.

Great care will be required in sharpening the veiner and parting tool, but a slip of fine cutting stone can be filed to a feather edge and used for the purpose, and it will, in this case, be better to sharpen the *inside* of the tool first. Another very useful tool is called a "maccaroni," and is frequently used for showing raised veins on foliage, etc. The cutting edge (as seen in Fig. 34, C) forms three sides of a square. This tool requires to be very carefully sharpened, and also requires some little practice to work it properly, but when skilfully used it is a valuable aid to the carver, and gives a most effective appearance to the veins of foliage and similar work.

FIG. 37.—EAR-RING—LILY OF THE VALLEY.

I have given two designs for brooches, with ear-rings to match—one of lilies of the valley, Figs. 35, 36, 37, and the other of ivy leaves, Figs. 38, 39, 40.

It will, perhaps, be better to commence with the ivy leaves, as these will be easier for the beginner than the lilies of the valley. Both brooches are intended to show a groundwork in the centre, and not to be cut through. Of course the centres could be fret cut if desired, but I think it better to leave as few sharp points or projections as possible. These points are always catching in something or the other, and are apt to destroy the dress; still fret cutting the centre certainly has the effect of giving a lighter appearance to the brooch. The ebony for these designs should be planed to the thickness of about $\frac{1}{4}$ of an inch, unless it is desired to make the work appear in very bold relief, when an additional $\frac{1}{8}$ of an inch would be required. A piece of thin white paper should be pasted on the ebony, and the outline to be fret cut (as in Figs. 36, 39), traced upon it. After being fret cut, glue down the ebony to a piece of deal, taking care to insert between the ebony and the deal a piece of brown paper, as advised in previous articles. The outline of the whole design should now be traced on the face of the brooch, and the superfluous wood cut away, and the background regulated with a small router, so as to be of uniform depth. In setting in the outlines care must be taken not to undercut the leaves. When this is done, use a quick tool to rough in the leaves and to show the course of the stem, afterwards regulating the outlines of the leaves, finishing the twist of each leaf and giving a rough appearance to the stem. Although it is impossible to exactly imitate the natural leaf and stem, still the chief characteristics should be preserved, and the amateur will find it convenient to have a few of the natural ivy leaves before him. The rough appearance is given to the stem by means of the veiner, parting tool, and a small flat tool. The next thing to do is to punch the groundwork, regulate the fret cut outlines of the design, and put in the necessary veins of the leaves.

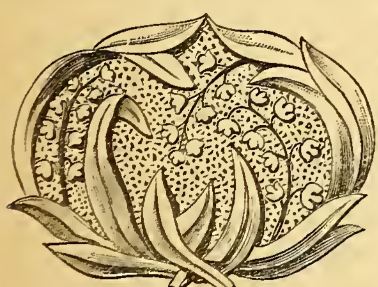


FIG. 35.—BROOCH—LILY OF THE VALLEY.

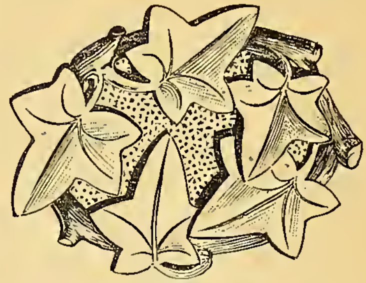


FIG. 38.—BROOCH—IVY LEAVES.

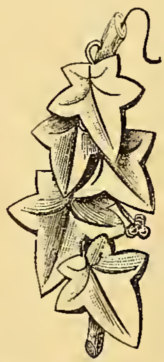


FIG. 40.—EAR-RING—IVY LEAVES AND BERRIES.

The brooch can now be taken up and the glue cleaned off the back. The edges of the leaves require to be chamfered from the back, and the stem rounded off, when we may consider the brooch to be finished, so far

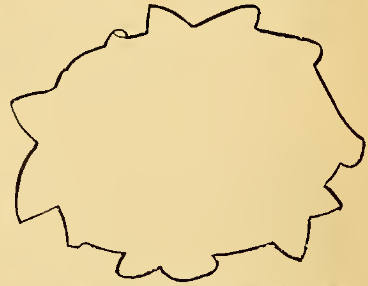


FIG. 39.—OUTLINE OF FIG. 38 FOR FRET CUTTING.

as the carving is concerned. Ebony should not, except in a very few instances, be polished, as it takes an excellent gloss if smartly brushed with a hard brush, which has been slightly moistened with boiled linseed oil. The carrings are carved in exactly the same way, and both can be fret cut at once, by gluing together and marking outline upon the upper one only. It must be noticed, however, that they be carved in pairs.

The fitting up of the brooch and earrings had better be left to a jeweller, although the amateur can easily do what is necessary if he feels so disposed. The brooch pins and catches can be bought for a few pence from any working jeweller, and with the small veiner the amateur can make the holes in the back of the brooch to admit the pins of the catch. A little powdered shellac should be sprinkled in the holes, and the pins heated in the gas and then placed in position, when owing to the melting of the shellac they will be firmly fixed.

With respect to the lilies of the valley, it will be necessary to get a few of the flowers and leaves, or else a large size drawing of them to copy from, as it is not possible in a small sketch to give every detail. Very little trouble will be experienced, I think, by the amateur in making these brooches, etc., from ebony, the only disadvantage is that this wood is rather brittle, and not easy to carve. A number of various designs will probably suggest themselves to my readers, and many of the jet and so called bog oak patterns can be copied or improved upon.

I had intended to give designs for an ebony bracelet in this paper, but must defer it until my next article, when I also intend to give instructions and designs for incised work.

My readers will find that this carved ebony jewellery bears a strong resemblance to the bog oak ornaments, so frequently seen in all Irish towns, and upon close examination it will be found that they are identically alike, bog oak and ebony being in the matter of ornaments convertible terms.

(*To be continued.*)

FERNERIES: HOW TO MAKE THEM AND MANAGE THEM.

By DONALD BEDE.

IV.—FERNERIES FOR INTERIOR DECORATION.

A SOMEWHAT novel and very interesting method of growing ferns in connection with an aquarium is illustrated in Fig. 21, a design made by the writer for the trade some seasons ago, which of course may be made up to any dimensions; but one sufficiently large to make a very pretty show, and at the same time not too large to be easily moved, is recommended, viz., 2 ft. 4 in. long, 15 in. wide, and 2 ft. 6 in. high, the water-line forming the height of the aquatic part being 8 in. from the bottom. The distinctive feature of this plan is that the ferns are grown in the upper part of the case, in rustic rockwork, Fig. 22, the lower and arched part of which stands in the aquarium. The framework of the case is made entirely of bar zinc—the base of No. 31 bar, the uprights of No. 46 angle bar, the shoulder of No. 11, and the top frame of No. 8.

It will be seen that the centre of the top forms a narrow oblong ventilator, which may be fitted with loose pieces of glass, so as to be regulated; or with a length of perforated zinc, which would always be open. The latter plan is recommended. This ventilator is ornamented with zinc fret, No. 54.

The amateur will probably find the making of the top part of this fernery somewhat difficult, on account of its sloping towards the centre from all sides, the amateur usually failing to get the four slopes all of the same angle, and consequently the whole thing gets awry. A little extra carefulness and perseverance will, however, enable this and all other difficulties to be surmounted.

The directions given in former parts for the construction of the lower part will hold good in this case, with the exception of there being six knobs or feet instead of four, and also that the screws of these must be soldered inside perfectly watertight. It will be as well to glaze the lower part before making the top, so as to save time in the setting of the cement. For this purpose, measure carefully the front and back frames, and then the ends. Glass which is known as 32 oz. will be required, and that of the best quality and as flat as possible. The best cement to set it in with is prepared as follows:—Get 3 lbs. of ordinary putty, 2 lbs. fine whiting, ground dry to a powder, ½ lb. of red lead, and mix up the whole with sufficient gold size to form a paste easy to work—that is, about the consistency of bakers' dough. Use plenty of elbow grease in working it up. Set in the large squares first, and then the ends, smearing the edges of the glass about half an inch with gold size, for the purpose of ensuring perfect contact. Be careful in pressing the glass well home into its position, and the less cement left between the glass and frame, consistent with its being fairly bedded in, the better.

This being done, form the bottom by running into the zinc tray a stiff batter of cement, made of two-thirds Roman and one-third Portland. When set, this will form a first-rate bottom, which, by reason of its perfect fit, is vastly superior to slate. When dry, just scrape away at the top of the cement next the

glass a small groove, about $\frac{1}{16}$ in. all round, which will be subsequently filled with copal varnish when the finishing touches to the inside are done. With this end in view, set the aquarium aside in a dry place until the putty has become hard, and the bottom has become a dry hard stone.

Meantime, proceed to make the top. Fig. 23 shows the same in plan. The No. 8 bar zinc will require a little preparation before making up, as in leaving the draw-bench the angles become curved, besides being widened larger than right angles; these can be put right by hammering on a piece of square-edged iron. Then make up the lower part of the frame so as to fit loosely on the top of the aquarium; if it fits tightly before the painting is done, it is very awkward to take off. Cut your slope pieces carefully, so that they are *exactly* the same in dimension. Then make the top, which will be a long oblong frame, 16½ in. by 2½ in., leaving the fret ornament to put on when the frame is complete. Set the glass in with plaster of Paris, mixed hot with size diluted with water. This sets very hard, and is also very useful as a stopping for the outside of the aquarium at bottom, where, instead of leaving a rough-looking putty mark, by using plaster, as above, and finishing off when dry with sand-paper, a very nice surface is obtained. This being done, paint the case to your taste (a rich chocolate is recommended, with gold lines); strain the paint through fine muslin, as the zinc being non-absorbent, every little grit shows. Finish with a coat of best copal varnish, giving the inside, at all the angles where the water touches, two or three coats, thoroughly drying each one before the other is put on.

Now for the centre piece. First make a skeleton frame, Fig. 24, by soldering together pieces of zinc bar; crooked or faulty pieces will answer this purpose. Length of frame, 18 in.; height at centre, 21 in.; ditto ends, 8 inches. Tack a triangular piece at each end, so as to enable the frame to stand alone. Now build up to imitate Fig. 22, using the method already described. In making the arches use a core of cardboard to support the pieces of cemented coke until set, then withdraw the cores, and make the arch as irregular and rustic as possible.

Now get some flower-pots, which must be covered with paper (see page 206). Put one on each end of frame, and tie one at back and front in the centre leaning forward, taking care that the bottoms do not reach within 8 in. of the bottom, that being the waterline. When these are in position and set, place two others in the centre, with the mouths facing the ends; cement these in carefully. Then, back and front, in the centre of these two, but high enough to allow room to get at the lower one, tie another, which set in the same manner. Afterwards withdraw all the pots, and strengthen the moulds inside with cement. This will give you eight receptacles for growing ferns, as shown in Fig. 25. This rockery should be sparingly coloured with paint made of copal varnish, coloured with dry colour.

Your aqua-fernery is now complete; but before any live stock are put in, take care that the tank is *thoroughly* seasoned—a slow process, but one which must be gone through, if you wish to have a successful and flourishing colony. The rockwork is not intended to be fixed in the tank, so that no dirt need be made therein when planting ferns, etc.

Fig. 26 is a design for fernery, the bottom part of which is decorated with Minton's tiles, the upper part, or roof, being of bent glass. The amateur will find the construction of this kind of roof quite easy. Having decided upon the dimensions, order through your glass dealer two segments, to be bent so as together to form a half-circle; then fit your framework to it, using T-bar for the ends, which can be readily bent to a half-circle. It will be as well where these bent roofs are used to have end, at bottom, doors with a wire catch, a detailed description of which will be scarcely necessary.

A zinc box inside, for the ferns to grow in, will prevent the tiles being damaged, or the setting disturbed. In selecting your tiles, carefully avoid any and every shade of green.

Fig. 27 represents an extremely interesting combination of open fernery with fountain, presenting the appearance of a ruined temple of a hexagonal form, and, being plastered with tinted cement of a somewhat irregular surface, is made very attractive. The roof of the temple conceals a water-tank, which forms the fountain supply, a pipe being led down one of the pillars to the fountain jet in the centre, the fernery concealing the reservoir into which the water falls, so that we have a self-acting fountain of a simple form, and complete in itself, requiring no fixing or water supply beyond what is contained in the roof. Its action is as follows: The roof tank being charged with water, it runs down the pipe and rises from the jet pipe to about half the height of the temple until the water is exhausted. The reservoir is then emptied at the bottom tap, and the water returned to the roof tank, and so on. The space all round between the reservoir and the outer wall is the part devoted to the growing of the ferns, the appearance of which is much improved by growing some small-leaved ivy, and trailing the same up the pillars. The construction of this interesting and attractive ornament presents no more difficult task than an ordinary amateur may be expected successfully to deal with; for this purpose some sheet zinc, compo pipe, some ¾-in. zinc tube and some cement and sand, being all that will be

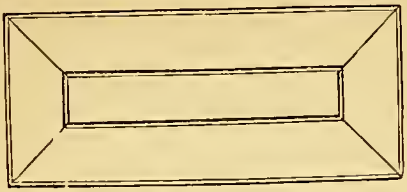


FIG. 23.—PLAN OF TOP OF FERNERY IN FIG. 21.

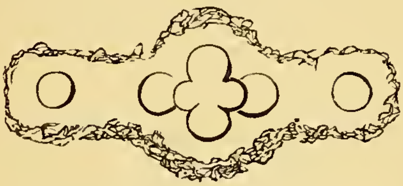


FIG 25.—PLAN OF CENTRE ROCKWORK, SHOWING POSITION OF POTS.

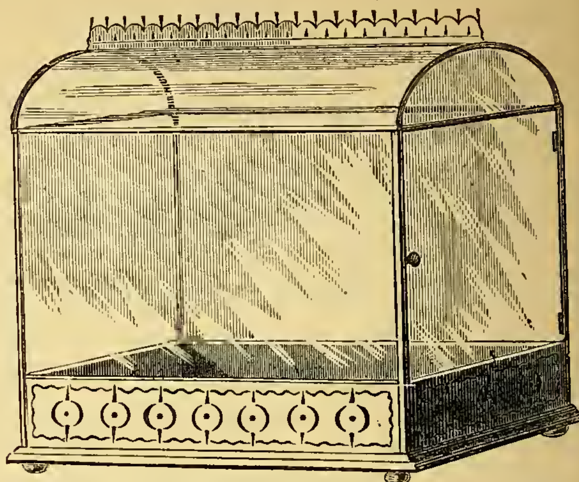


FIG. 26.—FERNERY WITH BENT GLASS ROOF, AND TILES AT BASE.

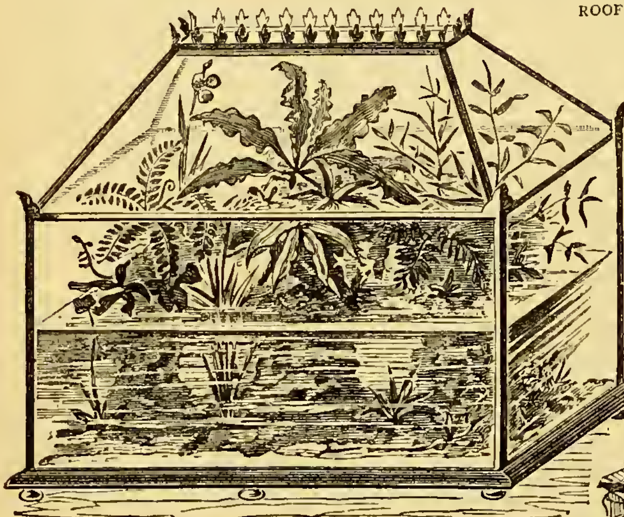


FIG. 21.—FERNERY, WITH AQUARIUM.

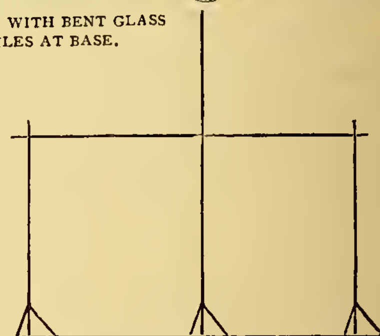


FIG. 24.—SKELETON FRAME FOR ROCKWORK.

FIG. 22.—RUSTIC ROCKWORK FOR FERNERY IN FIG. 21.

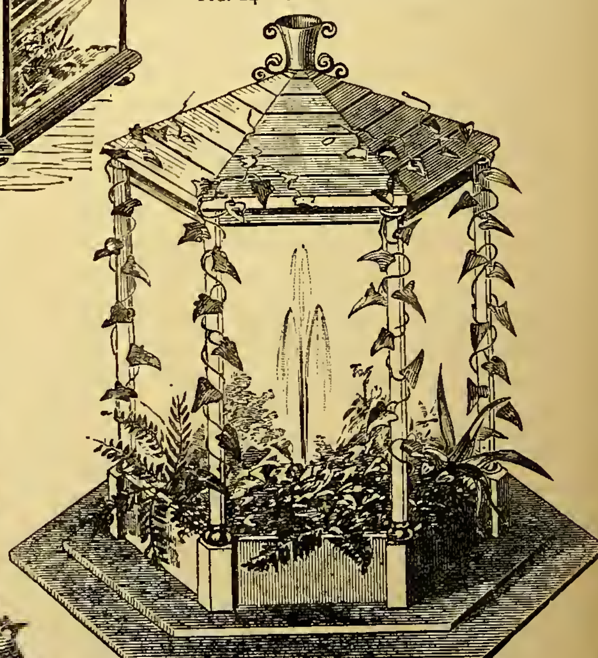


FIG. 27.—FERN TEMPLE, ELEVATION.

required. It may be made, of course, to any dimension, but one that I have just completed appears to answer very well, viz., height, 22 in.; width of sides, 6 in.; depth of wall where the ferns are grown, 4 in.; height of jet rock in centre, $3\frac{1}{2}$ in.; height of pillars, 14 in.; depth of upper reservoir in roof, 2 in.; depth of lower one, 4 in.; diameter of circular reservoir in centre of base, 6 in.

In order to strike the exact geometrical shape of these vessels upon the sheet of zinc, as in Fig. 28, open the compasses to the width of the side of the required vessel, viz., 6 in., and mark a circle whose radius is the same; then intersect the circle with the compasses, as at A, A, A, after which draw straight lines between these points, and cut to the lines; then to make up, solder on the band to the required dimensions. The upper vessel will be $1\frac{1}{2}$ in. larger in diameter, the six pillars being soldered on at the corners, and covered at the base with zinc bent square, to imitate a plinth, which I believe is the correct architectural term for this part of a pillar. This base is then attached to a zinc hexagon, bent downwards $\frac{1}{2}$ an inch, which will, when plastered, form a step, and this is further attached to a flat piece of zinc of the same shape, but an inch larger on every side. The fountain jet will be supplied by a piece of $\frac{1}{4}$-in. compo pipe soldered on to the top vessel, and passed through any one of the pillars (see Fig. 28); and another piece of the same material connected with the centre vessel will provide for drawing off the water to recharge the top. The roof is formed of an inverted funnel-shaped piece of zinc, with an opening $1\frac{1}{2}$ in. wide at top; a piece of perforated zinc should be soldered to this opening, and a piece of fine muslin used to prevent any dirt getting to the jet.

The mechanical part of the work is now completed, and the pleasing effect or otherwise will depend entirely upon the quality of the artistic touches with which the amateur imitates in plaster the appearance of decaying masonry. No part of the zinc work must be left uncovered, and, on the other hand, care must be taken that the covering is not clumsy. It is better to use several applications of thin cement, putting in the lines of the masonry as the last coat is setting. The work will require a little tinting, which is best done by using shades of brown, brightened in patches with mossy tints. Use dry colours in boiled oil, which will dry "dead" on the cement.

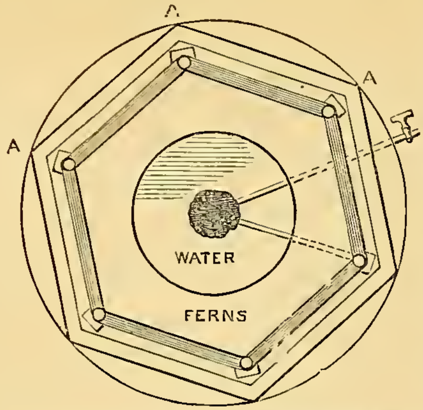


FIG. 28.—PLAN OF BASE OF FERN TEMPLE WITH CIRCUMSCRIBED CIRCLE, SHOWING HOW TO FIND HEXAGON.

Fig. 29 is a design in woodwork, embodying the principle of the well-known "Oxford" picture frame, and will be found very easy of construction, and marvellously cheap. As will be seen in the illustration, it consists of two Oxford frames, which form the back and front, the angle uprights of light zinc bar being attached with small screws to the frames, the top and bottom being connected by horizontal straight bars of wood, the growing part (a zinc tray) at base being covered on the glass with paper imitation of embossed leather. The top cover is a loose piece of 21 oz. glass, which slides, and may be utilized either for birdcage stand, as shown, or for statuettes, bric-a-brac, etc., etc. The woodwork is $\frac{3}{8}$ in. in thickness, and when made up looks surprisingly light; the wood can be purchased at most timber yards in London, ready planed for use. Fig. 29 shows the wood set off into equal squares at the corners, the other parts being rounded off with a file and afterwards sand-papered.

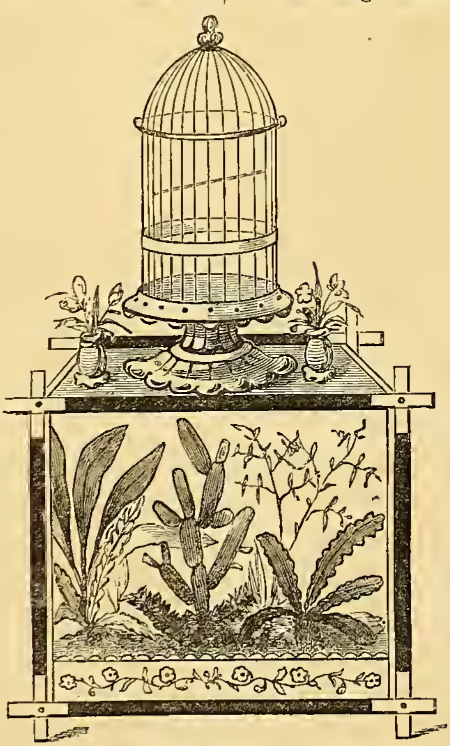


FIG. 29.—FRONT VIEW OF OXFORD FERNERY, WITH BIRDCAGE.

The designs that have been given afford sufficient variety of pattern to satisfy anyone of reasonable desires in this direction; and they will be found to afford ample room for selection for any position or rooms within doors.

(*To be continued.*)

NOTES ON NOVELTIES.

I HAVE received from Messrs. Wells, Gardner, Darton, & Co., *Paternoster Buildings, London, E.C.*, a most useful and interesting work, by Mr. H. C. Standage, a well-known writer on art subjects, the author of "Chemistry in Practice," "The Principles of Colour applied to the Fine Arts," "Colour applied to House Decoration," "Notes on Artists' Pigments," "Practical Picture-Hanging," "The Selection and Arrangement of Pictures for a Dwelling-House"—works to which I venture to call attention here, as I am sure that there are many readers of AMATEUR WORK to whom one or the other of them may prove useful as a reliable book of reference on the subject treated. The book before me—if I may call it a book—is entitled "The Artist's Table of Pigments, showing their Composition, Conditions of Permanency, Non-permanency, and Adulterations; Effects in Combination with other Pigments and Vehicles, and giving the Most Reliable Tests for Purity," is sold at 1s., and is very cheap at the price, when the value of its contents is considered, and the industry and practical knowledge displayed by the author in collecting the facts and information, and focussing them, as it were—bringing them together, so as to be easy of access to anyone who may require to consult them, without that loss of time which inevitably occurs when they have to be hunted up from many and various sources. The *brochure*—for it is this rather than a book—is oblong in form, measuring 16½ in. by 10 in., and consisting of eight pages of tabular matter and a dedication to Sir Frederick Leighton, P.R.A., who, in a letter to the author, written when the book was yet in embryo, says: "I think your idea is an extremely good one, and if it is carried out so as to convey the results of the most recent investigations in the matter of pigments, you will have rendered a real service to artists." There are six tables, the colours treated being classified as White Pigments, Green Pigments, Blue Pigments, Yellow Pigments, Red Pigments, and Brown and Black Pigments; about 180 different kinds of colouring matter being considered under these headings. Owing to its size, it is a little awkward to use; and I venture to suggest to author and publishers the desirability of reducing it to one-half, by folding the pages in the centre and binding them after the manner of an atlas, putting them into a stiff cover for better preservation. I consider Mr. Standage's work so useful, that I shall treat my copy in this way, so that I may be able to keep it ready for reference at any time on my book-shelves.

Messrs. Harger Brothers, *Settle, Yorkshire*, have sent me several sheets of their new copyright fret-work patterns, which are noteworthy for utility of purpose, for beauty of design, and for boldness and breadth of treatment. Space would fail me to dwell on each and all of them; but I may call attention to No. 314 (9d.), a Japanese Hanging Bracket, whose circular shape is novel, and its general treatment equally fresh and pleasing. No. 311 (9d.), Hanging Bookshelves and Cabinet, is also pretty and well-proportioned; but I would rather suspend it by cabinet hangers than by a cord, as shown in the drawing of the article, when finished. No. 305 (1s.), a Fancy Epergne, is bold and good, and may be utilized for many purposes. No. 301 (1s. 3d.), a Whatnot, with three shelves, is well conceived and carried out; and the same may be said of No. 307 (2s.), a Folding Screen; No. 308 (2s.), a Combination Cabinet Bracket; No. 310 (1s.), Wall Mirrors, Screens, and Brackets; and No. 312 (1s.) a Corner Etagère. When combined with a little carving, to give expression to the work, all of these would amply reward the fret-sawyer for the time spent over them; and there is little risk of disappointment through breakage when cutting, for the patterns clearly show that it has been the object of the designers to reduce this to a minimum. My readers must not forget that Messrs. Harger Brothers supply bevelled mirrors for such pieces of work in which this mode of adornment is introduced.

Mr. James Walsh, 5, *Marina Terrace, Cork*, has also sent me specimens of his skill as a designer of fretwork, and will in future give the readers of AMATEUR WORK the benefit of his facile pencil and ingenuity by becoming an occasional contributor of designs of this class of work to its pages. The patterns to which I allude, and which are published and supplied by Mr. Walsh, are a Miniature Altar (1s. 6d.), a Miniature Irish Outside Jaunting Car (1s.), Irish Motto: "Cead Mille Failte" (6d.), Motto: "Be Just and Fear Not" (3d.), and Oval Carte-de-Visite Frame (3d.). Of these the first two are most elaborate and beautiful examples of fret-cutting, and I only regret that the cost of engraving, which would be considerable, prevents me from accepting Mr. Walsh's permission to reproduce the photographs which he has sent me for insertion here; but I can assure those of my readers who are fond of fret-cutting that if they purchase these designs they will find them well worth the money and suitable for making fancy articles, which could not fail to attract attention at fancy fairs, bazaars, etc. The Miniature Altar consists of a central canopy with front, back, sides, and triangular top mounted on a platform or dais composed of three steps, and flanked by two wings in fretwork resembling in some measure the rood screen frequently found in old churches, especially Devonshire churches, which yield to none in architectural beauty. Under the canopy may be placed a statuette. That in the photograph before me appears to be one of the Ever-blessed Redeemer. In the Jaunting Car every part is composed of panels in fretwork, with wheels also in fretwork, shafts, etc., forming, when finished, a beautiful model of one of these vehicles. The prevailing ornament in Mr. Walsh's designs, as may be supposed, is the shamrock; but I never saw the shamrock more happily introduced into work of this kind. With regard to the wings of the miniature altar, they would look well if made on a large scale and cast in iron to serve the purpose of a screen or grille in any building of an ecclesiastical character.

Mr. Henry Vickers, 317, *Strand, London, W.C.*, sends me Part XXXIII. of "The Journal of Decorative Art;" a Monthly Technical Journal for the House Painter, Decorator, and all Art Workmen. The price of each monthly part is 7d. The part now before me contains some excellent alphabets in imitation of sign writing.

AMATEURS IN COUNCIL.

[The Editor reserves to himself the right of refusing a reply to any question that may be frivolous or inappropriate, or devoid of general interest. Correspondents are requested to bear in mind that their queries will be answered only in the pages of the Magazine, the information sought being supplied for the benefit of its readers generally as well as for those who have a special interest in obtaining it. In no case can any reply be sent by post.]

Interchange of Supplements.

The readers of AMATEUR WORK will remember that by an unfortunate mistake on the part of the binder, the Supplement illustrative of the "Fancy Jardinière," which should have been given with the present Part, was sent out with Part XXI. for August, instead of the Design and Working Drawings to Scale of the "Combination Saw Stand," as announced on the Wrapper of Part XXI. We have rectified the error as far as it is possible to do so, by giving in this month's Part the Supplement illustrating the different parts of the "Combination Saw Stand," and the method of putting them together. Our readers will kindly bear in mind that the descriptive letterpress referring to the "Combination Saw Stand" is to be found in page 491 of this volume, or, in other words, in the August Part, and that the directions for making the "Fancy Jardinière," issued in error with the August Part, are included in the present Part for October, 1883, which completes Volume II. As the Part to which each Supplement belongs is clearly stated on the Supplement itself, no confusion can arise in binding the Volume.

Organ Building.

F. S. (*Askern*).—The organs may be placed on any pressure you like, but $1\frac{1}{2}$ or 2 inch wind is sufficient for chamber organs. The subject of pressure will be fully explained in article on voicing and tuning.

PENNSBURY (*Clapham*).—The sample of paper enclosed would do for medium-sized pipes, but all those above 18 inches long should be made of stouter brown paper, of which an excellent quality for the purpose, 4 feet 6 inches wide, can be purchased in your neighbourhood, viz., at "Dean's," stationers, *Wandsworth Road*, for 2s. 3d. per dozen yards. Cartridge paper is best for small pipes, and is easier to work, as it lays so smooth. Your specification will do, but would be improved by carrying the open diapason down to CC (8 feet long), and these large pipes would form an effective front to hide the swell-box from view. The scale for open diapason should be 5 inches diameter for CC, and $2\frac{7}{8}$ inches for Tenor C, and the pipes of the other stops should be made the requisite number of scales smaller, as described in Part XII. If you have already made any pipes, they can still be used for the larger scale by cutting down at the top so that they speak the note indicated by their diameter on the scale. A gamba would be more suitable for a schoolroom than a keraulophon. Allow a slider the same width as the open diapason, and you will find a description of the gamba in a subsequent article. A twelfth would be an improvement, as I assume the organ is intended to sustain a large number of voices. As the organ is for a schoolroom, I presume you are not pinched for space, and could therefore make the soundboards 6 feet long and wide in proportion, so as to allow plenty of speaking room for the pipes, and they will sound very much better. If the pedal pipes are placed on each side of the organ, the case would be about 7 feet 9 inches wide, 4 feet deep, and 10 feet high, but could be got in a less space by allowing less speaking room. The organ would be better situated if placed in the centre of one end of the room instead of in a corner as proposed. As a schoolroom is liable to sudden changes of temperature, give all the pipes at least two coats of oil paint and two coats of varnish inside and out, and allow them to get thoroughly dry and hard before the instrument is brought into use. The bellows should be made as large as you have room for under the soundboards. Composition pedals are not really needed in so small an instrument, but will be described in a subsequent article. The height of the mouth of stopt diapason should be taken to centre of arched lip, and that of the Lieblich Gedacht may be anything from one quarter to one half.

H. S. (*Alfreton*).—Your soundboard, as described, would be large enough for an "oboe" stop, making a slider the same size as for the open diapason. The holes through the stoppers need only be regulated as regards diameter. As regards the quality of spotted metal pipes, it may vary considerably, according to the amount of tin used. Where the spots are very wide apart there is a minimum of tin, where they are close together and coalesce with each other there is a maximum, and the latter are the best pipes. If more tin were used, the spots would be absent.

ORGANIST.—A mixture of three ranks is a set of three rows of pipes all on one slider or worked by one stop knob, and they sound notes above the unison tone, according to the figures printed against them in the description. Their use is to give fulness to the tone where it is necessary to sustain voices, or where there are many stops. They are out of place in so small an organ as ours. "*Prepared*," as applied to wood, means planed and cut to size; if applied to an instrument in connection with the stops, it means that a slider is placed and pierced ready for a set of pipes that may be purchased and inserted at a future time.

WOULD-BE ORGANIST.—Your scales are correctly drawn so far as they go, but the flute should be placed on the left-hand side of the scale, as the longest pipe (CC) is only 4 feet long. The CC of the flageolet is 2 feet long. If you follow my suggestion of making each stop so many scales larger or smaller than the open diapason for the same length of pipe, you will not go wrong. I wish you every success in your endeavours.

J. S. M. (*Kensington*).—Ivories for keys can be purchased at Dawkin's, 17, *Charterhouse Street, Holborn*, from about 8s. to 12s. per set of five octaves. You need not cut your carpet away where the organ is placed.

R. H. (*Keswick*).—Ivories for the keys may be cut to size with a fine tenon saw, and polished with a damp linen pad, and finely-powdered pumice-stone. See article in Part X., Volume I.

H. A.—The longest pipe of the keraulophon is six scales smaller than the open diapason Tenor C, that is the same diameter as the F sharp of that stop. The CC flute will be the same diameter as the C sharp open diapason, and the CC flageolet the same diameter as the D 1 open diapason.

J. C. H. (*Waterloo Road*).—The directions as to gluing the pallets are quite correct, and the glue touching the leather over the pallet tends to secure the return of the pallet when released, and to prevent any escape of wind at the tail end when closed.

J. L. (*Kinross*).—You can make a keyboard for your harmonium by following generally the instructions given for the organ keyboard in Part X. You will only require the keys about half the length there described, and instead of having a centre pin you have a pin at the extreme back end. The keys act by merely pressing on the heads of the screws on the pallet levers.

A. G. (*Manchester*).—The soundboard shown in Fig. 5 of the Supplement is for a single manual, and though it might be made with more pipes, it would not be more useful than the small two manual. The bass notes of all the stops are, as before stated, the largest pipes in those stops. You could get the whole organ in the space you mention.

C. T. (*Chester*).—All the bass channels may be made at the bass end. Oboe and cornopean are reed stops, and I should not advise an amateur to attempt to make them. Dulciana is really a small-scaled open diapason, and may be three or four scales smaller than that stop, and should be very delicately voiced. A metal or paper principal would be better than a wood one. It is quite practicable to make a slider on the front cheek of the soundboard, but it would be very unwise to do so as it would weaken the soundboard.

GUILLAMUS.—The stops you mention as being priced at 6d. each are merely the stop knobs.

W. C. S. (*Newburgh*).—The pipes of the scales given in my article would do very well as a substitute for your damaged wood stopt diapason. A complete open diapason would be preferable to the pipes you mention, but the others could be substituted, though the result would not be so satisfactory. The best test for the depth of voicing is the sound given by the pipe itself; do not cut too deep at first, but try the pipe on a shallow voicing, and you will soon see what is required. The specimen of paper enclosed is too soft to give good results.

H. H. D. B. (*Blundellsands*).—Your second method of making the pipes with inverted mouths is the correct one.

J. H. (*Homerton*), writes:—You will be pleased to hear that I have been successful in making a stop (flageolet) of paper pipes, building frame, bellows, wind-chest, sound-board, and sliders, for five stops, and am just about to plant the stop I have finished, on the sound-board.

H. H. B. (*Glasgow*).—The extra size of the scale would account for the pipe having to be cut shorter to get the right tone; but you should not cut your pipes so much as a semitone sharp.

House Painting and Papering.

J. Sandwell writes:—In your Magazine there are words used which I cannot find in the dictionary that I have—Walker's, and I think it would be a good plan if the authors of the various subjects would make them plain enough for such of your readers as myself to understand, because it is useless for anyone to read and not understand what he has read. In the articles on "Carpentry" there are the words "dado" and "tiles." For the life of me I cannot get at their meaning, perhaps you will kindly tell me. Another good thing the authors would do for such as myself if they would thoroughly consider the cost of the material that they recommend to be used, because five shillings to me means more than £5 to some of your readers, and probably there are others whose capability of expenditure is as limited as mine. In the articles on "House Painting and Papering" the writer recommends for "whitewashing" (see page 328, Part XVIII., for May, 1883), half a bushel of lime, two pounds of sulphate of zinc, two gallons of beer dregs, and two quarts of boiled linseed oil, and some blueblack. Now, sir, the lime here is 1s. per hundred, the linseed oil 8d. per pint, the sulphate of zinc—I sent a boy to a druggist to know the price of a pound, the druggist said, "Oh, you want a pennyworth." The lad had a penny in his pocket and brought that much, barely a quarter of an ounce—at the rate of 5s. 4d. a pound! I sent to another druggist. He said the commonest would be 2s. per pound. Now, sir, at this rate, to whitewash the top of a room would cost—lime, 6d. (the beer dregs I cannot get at all), linseed oil, 2s. 8d., sulphate of zinc, 4s., blueblack, one halfpenny, and brush, 3s. 6d. (and this is a grass brush), and the tressels 5s. for the material to make them—this is what it has cost me, as I have made a pair. So that altogether it amounts to 15s. 8½d; but leaving the price of the tressels out, it would then be 10s. 8½d. But then there is the other "expenses clearcoling". expense. Why, sir, we poor men cannot follow this. Now, sir, my house is in a very bad state, in consequence of being unable to follow my employment for nearly six years, and consequently earn nothing to pay to have it done, so that I am compelled to do it as well as I can myself, and I am neither carpenter, bricklayer, nor painter; still I can do a little of each about my own home. Now, my cellar and rooms had not been done for a length of time before I got injured. So this last week I made two tressels, as per sketch in Part XIV., and I have whitewashed my cellar and the passage. I got some good lime, slaked it with boiling water, put in about a halfpenny worth of blueblack and a candle; the latter soon melted, and the walls look nice and white, and the smell is grand. Now, it is all very well for those that have plenty of money to have all the things recommended, but your authors should consider the poor, and tell them how to do according to their pockets. Why, sir, where can I have the money to do all my rooms according to these directions—or thousands of others as well as me? It is absolutely out of our reach. Though I have written a long letter, yet I want to ask for a little information, and I think you can help me. The ceilings of my kitchens and bedrooms have been done at some past time with some kind of red ochre, so that they are between a red and a brown. When I put the whitewash on they look very bad. I cannot make them look nice and white. Now, sir, how can I do with these ceilings to get this old colouring off, and make them look nice and white? The walls of my bedrooms are not papered, but coloured blue. Now, I should like to whitewash them (I mean lime-wash), and then either to paper them or colour them blue again. Now, if I whitewash them with lime will it take the blue colouring after, and how must I mix my blue colouring? Mr. Edwinson does not say anything about this. Or will the lime-wash take the paper? I hope you will not think any ill of me complaining, but receive these lengthy questions and remarks in the same kind spirit as they are sent, and that you will tell me the meaning of the words "dado" and "tiles," and kindly give me the information about the ceiling, and how to recolour the walls of my rooms blue.

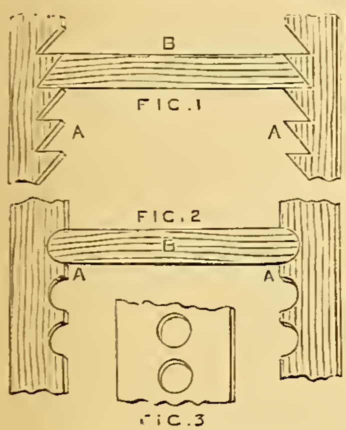
I have given Mr. Sandwell's letter in full, because if I had not done so, the reason for my reply would not have been clear, perhaps, to readers of Amateur Work generally. (1.) I fail to see myself how the writers of the articles that appear in this magazine could make them clearer and more explicit than they are. The words "dado" and "tile," of which you ask the meaning, are used very frequently in the present day; and in my ignorance I supposed that everybody—at all events, everybody who reads Amateur Work—knew what they mean. Get rid of your "Walker" and buy Ward and Lock's "Standard Etymological Dictionary," price 7s. 6d., and in this you will find the meaning of both "dado" and "tile" duly and clearly set forth. For your personal satisfaction, however, I may say that in a room the dado is that portion of the wall which lies between the chair-rail, real or sham, and the skirting board, including these parts; and if you do not know what a chair-rail is I will add that it is a strip of wood, plain or moulded, attached to the walls of a room and running round them, except where its continuance is broken by door, window, or fireplace at *chair height* from the floor, and intended, as far as its practical utility is concerned, to protect the wall from being injured by the back of any chair that may be put back too roughly and thrust against it. You must know what a roofing tile is, and what a paving tile is, and on this point I need only say that the tile used in decoration is square in form, varies in size from 4 inches square to 8 inches square, or even more, is made of earthenware, papier-mache, and other substances, and is glazed, painted, or otherwise embellished according to the nature of the material of which it is made. (2.) With reference to Mr. Edwinson's recipe for making whitewash, I may say that it is intended for whitewashing on an extensive scale of operation, and that the preparation supplies as durable a wash of this nature as can be obtained. When he tells you to use beer dregs, there is no difficulty in seeing that he means stale hard beer unfit for drinking, and this, I am sorry to say, from personal experience, is to be met with far too frequently in all parts of the country where beer is brewed and drunk. As to the proportions, you can easily reduce these to suit your requirements by resorting to simple division. You can make good whitewash—say, a pailful of it—with two or three large lumps or "stones" of unslaked lime, some water, a pound or two of size, and a very little blue-black, or indigo blue, and this ought not to cost more than a shilling at the utmost, though materials are sold at widely different prices by different persons, as your experience with the druggist goes far to prove. But druggists' prices are as a rule high, and if I wanted sulphate of zinc in any quantity I should not buy it of any dispensing chemist. It is scarcely fair to include the tressels in the cost of the whitewash, for these, when once made, form a useful part of your "plant" for indoor and outdoor work, and are available for other purposes than the single job of whitewashing for which you made them. By using a little thought and judgment you made a good and cheap whitewash, and materially improved the appearance of your house from a sanitary, as well as a cleanly point of view. (3.) And now I come to the ceilings of your kitchens and bedrooms, which you say have been coloured with "some kind of red ochre," a queer taste on the part of the colourist, and the bedroom walls which are coloured blue. Mr. Edwinson has told you, before you attempt to put on the new coat of whitewash or coloured wash, to wash off the old colouring matter, and this you must do from both ceilings and walls, using your broad whitewashing brush and plenty of clean water, which must be renewed from time to time as each pailful becomes dirty. You will thus clean off all the old coating of coloured wash from ceilings and walls, and render the former fit to receive the whitewash when the plaster is dry, or nearly so; and the latter fit to take the coloured wash, which is made by adding some colouring matter, which you can procure for a few pence of any oil or colour man. A lime-washed wall will not take paper. If I were in your place I should, after washing them, apply a solution of Condy's Fluid, or carbolic acid, or any disinfectant of this kind, to the walls to thoroughly sweeten them; then, after stopping all holes, cracks, etc., with plaster of Paris, give them a coat of size, and on this hang your paper, if you prefer to paper your rooms. If, however, you decide on colouring them, you can relieve their otherwise monotonous appearance by running a border in stencil round the top of the wall, immediately below the ceiling (or cornice if you have it), and round the mouldings of door, window, and fireplace, and above the skirting board. I have now done my best to help you, and I trust you will be satisfied with my reply, which has run to even a greater length than your "long letter."

Rubber Stamp Making.

I have been requested to state that orders for articles connected with this process, previously supplied by Messrs. Henry J. Martin & Co., Rubber Stamp Makers, *Cork*, may be addressed in future to Messrs. Taylor, Cook & Co., *Fleet Street, London, E.C.*, by whom they will be duly executed immediately after reception.

Bearers for Bookshelves.

T. W. (*Stoke-on-Trent*) writes:—Having occasion to make a bookcase for myself, some little time back, I availed myself of the ideas given in your paper, but instead of adopting the old-fashioned zig-zag ladder for supporting the shelves, I simply took a piece of ¾ inch deal, and bored a number of holes in it with a centre-bit, and then sawed it down the middle, by which I got the couple of ladders in a few minutes. The accompanying sketch will explain what I mean. Besides being made in far less time



BEARERS FOR BOOKSHELVES.

Fig. 1.—Old style. A, A, Uprights; B, Bearer. Fig. 2.—Improved mode. A, A, Uprights; B, Bearer. Fig. 3.—Mode of preparing uprights.

it is far stronger than the former style. Having done a great deal of fret-sawing myself, and using the best machine made (the Fleetwood), I strongly advise fret-sawyers, who aspire to excellence in their work, to avoid cheap machines, as they are only a source of continual annoyance, and most extravagant in the breakage of saws. Since the advent of the "Griffin" saw I have abandoned the old kind entirely—one Griffin being worth a hundred of the others.

Shooting and Planing Boards.

J. H. (*Homerton*), sends the following useful communication on this subject:—Shooting boards made by gluing two pieces of board together, are very apt to twist and cast through the action of the air, and once out of square, are very hard to set right, generally requiring to be pulled apart, and made again. My plan renders this unnecessary. Take two boards (the length you require the board, allowing at least a foot extra for the plane to run, thus, to plane up five foot stuff, make the board at least six foot) of thoroughly dry pine 1 inch thick and 11 inches wide, and plane them perfectly true, now cut 4 inches off one the whole length of the board; these two pieces are for the bottom board, and across these you will glue about eight pieces of ½ inch pine 1½ inches wide by 10 inches in length, and one piece 5 inches in width by 10 inches in length to build up or strengthen the upper board where the groove will come (as in Fig. 1), leaving a gap 4 inches wide between the two bottom boards, thus making it 15 inches wide; now glue on the upper board, allowing it to lap an inch over the cross-pieces (as in cross section), and screw together with 2 inch screws from the bottom, this will allow the top to be planed if it should cast, as the screws do not come through, and the edge being raised and lapping over the

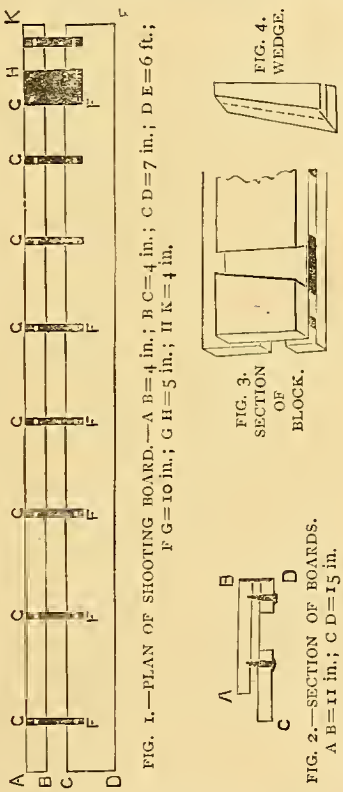


FIG. 1.—PLAN OF SHOOTING BOARD.—A B=4 in.; B C=4 in.; C D=7 in.; D E=6 ft.; F G=10 in.; G H=5 in.; H K=4 in.

FIG. 2.—SECTION OF BOARDS. A B=11 in.; C D=15 in.

FIG. 3. SECTION OF BLOCK.

FIG. 4. WEDGE.

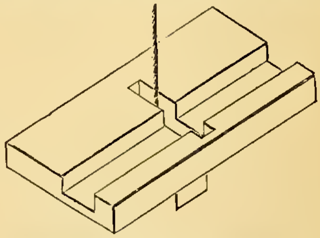
cross-pieces, allows the edge to be squared, without parting the boards, while the air having free play all round the boards they are not so likely to cast, and, in shooting an edge, the shavings and dust work away under the top board, so as not to throw the plane out of square. The blocks are generally screwed across the board, but I cut a groove across, wedge-shape, 6 inches from the end, and cut wedges of various thicknesses for planing wood of any substance, so that the plane may run over the block, as in section. I am willing to execute orders for these boards at 1s. 6d. per foot length, and blocks at 6d. each. [For address apply to Editor.]

Buckled Bicycle Wheel.

DR. H. M.—In most cases, if a buckled wheel is taken by two persons and twisted back, it will jump into its former position, and is often little the worse; if, however, it wobbles badly when being turned, it may be put right by slackening all the spokes, straightening the bent ones, then casting the eye along one side of the wheel rim the bends will be easily seen, these may be pressed straight over a block of wood on the floor or bench. When the rim is thus made straight, tighten up the spokes and true the wheel by measuring from hub to rim with a lath of wood, placing it close alongside of each spoke. All this may be done by an amateur without removing the tyre, and need cost him nothing.

Cutting Dovetail Joints by Mechanical Aids.

J. C. (*Dublin*) writes:—On looking over the article entitled "On the Use of Mechanical Aids in Cutting Dovetail Joints" in the July number of AMATEUR WORK, I noticed a curious mistake of the writer. He spoke of the guides for cutting the dovetail, and showed how to make and clamp them on to the table. The guides, as he describes them, will not give a proper dovetail, as his fixed guide forces the piece to move in a diagonal line as compared with the line in which the saw tends to cut, thus the only way his plan would work, would be by main force to make the



ISOMETRIC SKETCH OF FALSE TOP FOR TABLE.

saw cut sideways, which would not do. For cutting the dovetail he must make a second table with a slip on one face to fit into the groove in the first, or permanent table, and a groove on the other side, exactly at right angles to the groove on the first table. He must put the slip on the guide at right angles to the way he described it, and move guide and wood together up against the saw. This false table, or top, of which I give an isometrical illustration, must have a slot for the saw instead of a hole, as the top has to move across the under table for adjustment.

Cement for Bicycle Tyres.

E. P. (*Great Yarmouth*).—I am not prepared to give reliable instructions for making cement. If you want cement only for your own use, I think it would be undesirable to attempt making it, as small quantities can be bought for a trifle. If you read the papers on Wheelbuilding and Fixing Tyres, in recent Parts of AMATEUR WORK, you will have found full instructions on the subject. A first-rate cement for cuts is Rankin's Kilmarnock Bicycle Stop.

Electrical Matters.

GRANULE BATTERY—ELECTRIFIED LAWYER.—Your electro-motors have a low resistance and consequently require more current to work them than can be supplied by your small granule cells. I have known a large three cell granule battery to drive a motor continuously through one day of eight hours without stopping. I am not well acquainted with the Griseom battery. An article on the battery requested by you is now in type, when it appears you will learn from it the causes of your failures.

ELECTROTYPING SOLUTIONS.—V. (*Ambleside*).—The solution mentioned by you is only suitable for the deposition of copper on iron or steel, and is worked cold with a current from three Bunsen cells in series. A solution of sulphate of copper alone is the most suitable for producing an electrotype. Blacklead too expensive! What next? Use the best blacklead. One pennyworth will be enough to cover an acre of moulds. There are other more expensive conductors.

MAGNETO-ELECTRIC MACHINE.—IN A FIX.—An illustrated article showing every detail of a magneto-electric machine, appears in this Part. From it you will learn all you require to know.

ELECTRIC GONG.—E. H. P. (*Manchester*).—It is simply a mechanical contrivance which you can easily understand by examining one of the bells. There is nothing electric about it.

FLEXIBLE CORD FOR ELECTRIC BELLS.—J. W. (*Fallowfield*).—See our Trades' Directory on advertisement pages, and consult Mr. Dale or Mr. Archbutt, both advertisers in our columns.

MAGNETO-ELECTRIC BATTERY.—MAGNETO.—This can be purchased at as low a price as 18s. from either of the gentlemen mentioned above. See also the reply to "In a Fix." We thank you for suggestions, but must decline to undertake the grave responsibility of giving medical advice to enquirers, except in very simple cases.

ELECTRIC INDICATOR.—EDWARD JOSEPH, 8, *Bull Ring, Birmingham*, writes :—"I have made several of the articles described in AMATEUR WORK, and am very much pleased with them. Having a lathe, I should be pleased to supply my brother amateurs with several little articles at a nominal price, such as electrical binding screws, contact-breakers, and parts of electric bells, electric bells complete, simple galvanometers (such as those described in AMATEUR WORK), induction coils, etc. etc." Electric indicators will come up for treatment when space can be spared for the articles.

CUTTING ZINC PLATES.—B. E. Z.—Fix in a vice, and cut with a hack saw, or line out the sizes of the strips with the tang of a file, deeply groove the lines with the file, and break off the strips one at a time whilst held horizontally in the vice.

INDUCTION COIL.—L. W. W. Your questions respecting a coil to give a six inch spark when worked by the current from three Grove's cells, shall receive consideration in a forthcoming article on coils. Replies to questions dealing with information already supplied in articles published in AMATEUR WORK, will be freely given, but we must ask you to wait for fuller information on such subjects as those you mention than can be supplied in this department.

Construction of Alhambra Table.

T. A. D. (*Devizes*).—The designer of the table suggests that a groove cut in the way shown is impracticable, a slip of wood, say quarter inch square fixed on the leg each side of the place the groove would occupy, might answer the purpose, or the groove if cut need not be more than a quarter of an inch deep and could be worked with a small chisel without great waste of time, as the angle it is cut is of slight importance, provided the front edge of panel keeps true to the leg, it matters not if the leg fits panel or the panel is bevelled to fit an ordinary groove in the leg. The idea of fret-cutting an imitation tile is good in the effect that would be produced if each part were sand-papered by hand, and then put together, the slightly bevelled surface of every part would reproduce the inequality of the glaze, but the enormous waste of time to complete a number, and structural weakness, should be enough to decide against it without regard to the colouring. The locality you date from enables the getting actual tiles, I presume, an impossibility, otherwise the plain rich yellow tiles in low relief of the Burmantoft's Faience, or the modern eastern tiles imported by Holme & Co., *Farringdon Road*, would answer your purpose. The papyrotiles are tasteful and pretty, and cheap and light, but also eastern in design. There are reproductions of eastern tiles in some of the modern wall papers, but without a special search among the various makers I am unable to say precisely where to obtain them. The Japanese panels of open lattice work would replace the tiles or the old Cairo lattice could be imitated. The "Furniture Gazette," of May 1st and 8th, 1880, gave drawings of this Cairo work and also of Persian tiles. A low bench running all round the walls and cushioned at the back, would do for the lower part of the room, also this might cover hangings to the ceiling, while the doors treated in the over-door Moorish style in AMATEUR WORK, Part for July, 1882, and painted with bright arabesques, would give the style for the other woodwork; a few hanging lamps, or Japanese lanterns would be suitable. The Indian dhurries imported by Liberty and others, from 2s. each, would be appropriate hangings. If the Japanese style were chosen, tiles would cease to be a necessity, and this very adaptable style would allow of wonders with very small amount of work. A smoking room in this style will be described in an early number of this work, and will contain a few sketches of details.

Dead Polishing.

J. H. (*Homerton*) writes:—I saw an answer to a correspondent saying, "Work is not polished in a lathe;" as a fact, circular work is much easier to do in a lathe. Dead polishing is entirely in the finish; the job is finished in the usual way, and then made dead "or dull" by rubbing with finely powdered pumice stone specially prepared; it is to be obtained at most shops where polish is sold.

Telephones.

BEZ.—The instrument you describe is of American make, and its name, "Blake Transmitter," is stamped on the outside casing. It is in reality a microphone, and requires an induction coil, worked by a single Leclanché cell. That which you call a brass knob (marked "P" in your sketch) is, if you examine it closer, a small block of carbon, which presses against a little knob of platinum fixed to the end of the thin brass spring, which you have marked "O." This platinum knob, again, rests against the diaphragm, the vibrations of which vary the pressure of the carbon and platinum, creating a wave in the electric current passing through them. If you will send your name and address to the Editor, with a stamped envelope, for him to forward it to me, I shall be most happy to give you a personal interview, as I reside in the same town from which you head your letter. I can then explain all you ask, and perhaps help you to ride your hobby, so that you may not run over or injure your "little go" at the University.

J. K. S. (*Cannes*).—The "peculiar noise" in your telephone may arise from a bad "earth." If you have attached your "earth" wires to a brass or iron pipe, be careful to scrape off any lacquer or polish, and then make sure that the wire is firmly attached to the plain metal. If it is a lead pipe, scrape off the skin and fix your wire to the clean bright lead with a little solder. The diaphragm being, as you say, bent may cause it either to touch the end of the magnet, or keep it too far off, in either case preventing it from vibrating freely; flatten it out with a wooden mallet.

Setting-up Music Type.

YESSOF.—Music type differs little from ordinary type, save that the heads and tails of crotchets are on different pieces of metal, all the various signs being cast on a body, on the line, or space, as the case may be. Care is required in setting, and knowledge of music almost indispensable. Music type is very expensive, costing as much as 15s. per pound.

Electric Bells.

J. F. B. (*Milford*) writes :—In Part VII., June, 1882, in an article on Electric Bells, a hope is held out that something would be given on the pneumatic way of managing such bells. I have laid all the pipes required for it in the house I now occupy. I did so myself, while the house was in building. Might I ask will enough soon be said to enable a handy man to complete the pneumatic part of the arrangement? I am not afraid of the electric part of the work; but I would need some assistance on the pneumatic part of it. [Mr. Edwinson will shortly take this in hand.—ED.]

Painting Bicycle Spokes.

E. H. PRIOR.—Bicycle spokes are painted with ordinary paint, any colour to fancy. Brunswick Black ("Judson's Blackall") stands better than ordinary paint. Ebonite enamel is sold in bottles, 6d. and 1s. each, prepared by J. Ardill and Co., *St. George's Works, Littlewood House, Leeds*. It is jet black, dries very quickly, and is very hard.

Supplements to "Amateur Work."

IAGO CYBI writes:—I offer the following suggestions for keeping the supplements presented with AMATEUR WORK. I see it was impossible to make the sheets of less size than what they are. Get two pieces of cardboard a little larger than the sheets, and make a case with them the same as the case of a book, but instead of leaves, put in some slips of paper about an inch wide. Cut out all the supplements and paste them on some stiff paper, or linen, and after they are dry, either paste them, or gum them, one to each of the slips of paper in the already made case; this will be found to be more convenient when perusing AMATEUR WORK (whether bound or in single parts), than when they are bound with the parts; and on the case inside make a small pocket for keeping scales, or working drawings, which may be made. To make the scales, proceed as follows: Supposing the scale is ½ inch to a foot, get a piece of stiff card, or thin box-wood, say about 6 inches long, mark 6 inches on it, divide the first inch into 12 equal parts, or 24 parts would be better, divide the other 5 inches each into 4 or 8 equal parts, which will be equal to 3 or 6 inches, now you have a "2 foot rule," 6 feet long, and as the first inch (or foot) is divided into inches, you can measure the number of inches with it, if the scale is 1½ inches divide the 1½ inches into parts the same as before, and the same for any scale to which the drawings are made.

Plain Carpentry.

A. B. (*Hackney*).—1. You will find all the information that you can require on plain carpentry in "Every Man His Own Mechanic." A cheap edition of Part I. of this book, which is entirely devoted to the subject you mention, will shortly appear. 2. An article on the method of making a carpenter's bench suitable for amateurs is in the printer's hands, and will appear in an early part.

Clock-repairing.

T. B. T. (*Carnew*).—The prospectus of Vol. III. of AMATEUR WORK which appears in the advertisement pages of this Part will furnish a reply to the greater part of your letter with reference to musical instruments. The subject of repairing clocks will shortly be taken up by another writer, with whom arrangements are now pending.

Amateur Workshop.

TRICYCLIST writes:—I take the liberty to suggest that you devote three or four columns monthly to Amateur Workshop, fitting engine up for same, ½ to 2-horse power, best way of setting shafting out for lathe, grindstone, fret-machine, etc.; best kind boiler for same; mode of supplying same with water, without much trouble; any improvement in injector pumps, etc. [This work will receive attention in the pages of this Magazine as soon as room can be made for it.—ED.]

Decorative Carpentry.

W. G.—The articles on this subject are generally issued in alternate parts of this work, and will appear until the subject is fully treated.

The "Magand" Press.

ADVANCE.—The "Magaud" Press can be inspected, and, I believe, purchased at the printing shop in *Ludgate Circus, London.* Price would be some £40. For small card printing-presses apply Birmingham Machinists' Company, Printers' Engineers, *Birmingham.*

Spence's Metal.

W. E. R. (*Bawtry*).—Spence's metal is a sulphur compound, patented and made by a company formed for the purpose. It may be obtained in most large towns; and in small quantities can be had of C. Malins, *Hill Street, Birmingham*; price about 4d. per pound.

French Polishing Bookcase.

C. S. (*Nottingham*)—1. After having well sand-papered your work to get a perfectly smooth and even surface, stop all holes with some preparation for wood-filling. The "American Wood Filler" is considered excellent for this purpose. Then apply the stain to the wood thus prepared, and, lastly, French polish the surface. 2. Thank you for your esteemed offer, but I have many things of this kind on hand that have not yet appeared through want of space.

Bookbinding.

J. D. HOBBS.—1. You can certainly do without a beating stone and hammer; if you pass your book through the mangle you have, in thin sections, say of six sheets, the book will be firm enough, but it will be advisable to press them in the copying-press. 2. Pressing-boards vary in thickness, those I have in use are made of iron, ¼ inch thick, with a thin millboard pasted each side. Cutting-boards are ½ inch, tapered off to ¼ inch; backing-boards somewhat thicker, but at an angle at edge. It is advisable to use the boards the same length as the books. 3. The press running in when pressed up, shows that the guide-pins are not true. 4. Your last question I do not quite understand, but see p. 227, Vol. II., for cutting press and plough.

J. M. (*Brook Street*).—1. Is answered, or rather will be answered, in the papers devoted to Finishing. 2. Your query respecting edges is answered in Part XVIII.

A. B. G.—The true Roxburghe style is gilt top, dark colour, straight grain, morocco back; no hands or corners. Sides covered with dull, deep, red paper; white end papers, and lettered rather high up on the back.

GROLIER.—I hardly think that you have gone carefully through the book on binding by Zaehnsdorf, or you would find all you ask for in it. Read the book again, and put down the various articles as mentioned. You will then have a complete list, and also where they can be had. Bookbinding requires more patience and thought than most trades.

Tool Making.

IAGO CYBI.—On reconsidering my previous reply to you, I had better point out to you that you can buy such tools as bench-planes, moulding-planes, etc., far cheaper than you can make them, however explicit in detail any instructions for making them may be. Indeed, it requires practised hands to turn out well-finished tools. For tools that a handy man, whether professional or amateur, can make for himself, instructions have been given, and will be given in this Magazine, when opportunity offers.

INFORMATION SUPPLIED.

Impressions of Ferns.

A. S. (*Stockport*) writes:—In answer to R. C., for instructions how to take impressions of ferns, etc., I will describe the method I adopt, which is — Procure some smooth cartridge paper, then take the ferns or leaves and arrange them in position. If ferns, they look well put in groups; if ivy, it will look well as a border, but whichever it is, put a pin through a leaf here and there, to keep the fronds from moving—very fine pins, or the holes will show. Then procure a small-tooth comb, a stick of Indian ink, and a tooth-brush. Dissolve the ink in water—don't get it in lumps—and dip your brush in the ink—do not get too much on—and rub in gently along the comb, holding it over the group of ferns. If you get too much ink on your brush, it will fall in big drops; the object is to make them as fine as possible. Rub more on near the joints of the ferns, just as in a photograph, and let the colour gradually die away to the edge. Take the ferns off, and you will be surprised at the effect you have produced. If done neatly your ferns will bear a strong resemblance to a large-sized photograph. I shall be happy to supply further instructions if these are not sufficient.

INFORMATION SOUGHT.

Gilding on Stone.

YEOMAN writes:—Will anyone kindly inform me how to gild a tombstone, the letters are cut in the stone, and it is a kind of slate. I have tried Judson's Gold Paint, but the stone being outdoors, the paint will not stand. [This will be treated in "The Art and Mystery of Gilding," a series of papers which will appear in Vol. III.—ED.]

Transfer of Photographs to Wood.

EVERICAL writes:—I shall be much obliged to anyone who will inform me how photography can best be applied to wood engraving, *i.e.*, that the positive can be transferred to the wood blocks, and the wood-cutting made direct from the photograph without the necessity of making any drawing by the hand on the wood. The writer is a practical photographer, and wishes to make use of negatives so that they may be reproduced cheaply, and printed in a serial with the type, in the same manner as a wood-block, and where many thousand copies are required. Should there be any other process by which photographs can be more readily and cheaply multiplied for printing along with type, than by wood-cutting and printing, the writer will be glad to have it described by any correspondent who will kindly take the trouble. It might put many photographers in the way of making their work more generally useful.

Washing Machine.

J. S. (*Orkney*) writes:—Would you, or any of your able correspondents, give me information on how to make a thorough good washing machine, one that is not considered to damage the clothes. I should feel greatly obliged if you could give instructions how I could construct a simple planing machine. [Mr. Graham has the planing machine in hand. I shall be pleased to receive an article, illustrated, on the method of making a useful washing machine.—Ed.]

Firework Cabinet.

L. W. O. writes:—Could anyone tell me where I could get a firework cabinet, containing apparatus and chemicals; also, what would the price be of it?

Enamel Paint.

Victor writes:—I shall feel obliged if you can inform me, through the columns of the "Council," of the recipe for making enamel paint, similar to that used on Venetian blind laths.

Stringing Lawn Tennis Bat.

H. C. S. writes:—I think an article on stringing lawn tennis bats would be very acceptable to the tennis-playing part of your readers. I have tried to do it twice, and have never been able to get the gut tight enough. Is there not some process to which the gut has to be submitted before using? [Will any reader send a short paper, illustrated, on this subject.—Ed.]

Re-polishing Wardrobe.

J. W. C. (*Henwick*) writes:—Would you kindly advise me what is best to do to restore the glossy surface on a mahogany wardrobe, which is affected in the following way—the polish seems to have dried into the wood, and a kind of rust seems to have spread over the greater part. I have rubbed repeatedly with a mixture of turpentine and beeswax, but the rust comes through. Wardrobe made about two years ago; rust appeared three months after. [To your second query—use linseed oil.—Ed.]

Knitting Machines.

Anxious writes:—Will you kindly recommend a good knitting machine, or state from what firm I might be able to procure price list or illustrations?

Chip Baskets.

H. S. asks—1. How are the wooden or chip baskets made? On a shape? And how are the chips or laths made to bend without breaking? And are they obtained by splitting or planing the wood? Is there a machine for making the chips? How are the chip punnets made one sees in the London markets for fruit, etc.? 2. How is so-called ivory paper — ivorine — made? [With reference to your other requests I will do my best to supply your requirements.—Ed.]

Camera Obscura.

T. W. (*Stoke-on-Trent*) writes:—May I ask if you or any of the readers of Amateur Work can favour me with instructions as to the best and simplest mode of constructing a camera obscura, together with the *hut* necessary for its manipulation. [I shall be glad to receive an article on this subject, accompanied by diagrams and working drawings.—Ed.]

Pitting of Soldering-Iron.

A. F. S. (*Dresden*) writes:—Could you tell me why it is that a soldering-iron becomes pitted after being used once or twice? I have used soldering-irons for the last seven or eight years, but I have never, until lately, had one pit, as I have now. I use them like most plumbers, dipping them in water before use, and I take care never to overheat them. The solder is pure tin generally, but sometimes a mixture of tin, lead, zinc, and antimony. I have a new iron, which has only once been used with tin solder, and it pitted at once. Is it a sign of bad copper, or what?

Conjuring Tricks.

G. H. P. (*Gateshead*) wishes for some instructions, with diagrams, for conjuring apparatus that can be made on the lathe. [Your other requests and suggestions shall receive consideration.—Ed.]

Enamel on Coins.

E. C. D. asks:—By what means is that beautiful enamel produced on coins, and how would they advise an amateur to set to work to gain the desired results? It seems to be a "trade secret" here.

Cleaning Old Armour.

G. F. (*Hereford*) writes:—Will you give a receipt in your Magazine for cleaning old armour, old swords, etc., to make them bright to hang against old oak panelling? [I cannot help you to procure oak panelling for your room.—Ed.]

Chemical Cabinet.

J. S. (*Lockerbie*) asks—Can any reader give me sketches and sizes of a small chemical cabinet? I would like it the shape of a bookcase; the bottom part to hold the chemicals, with doors, the upper part (without doors) with shelves to hold volumes on chemistry.

Spring Washers.

F. J. W. writes:—Can you, through your valued periodical, inform me where I can obtain spring washers, which prevent nuts coming off bolts? I want them to take a half-inch bolt, and require them for the wheels of a dog-cart.

Liquid Brass Polish, etc.

J. H. R. (*Middleton*) writes:—I should be much obliged if you or some of the readers of Amateur Work could give me a good receipt for liquid brass polish for cleaning chased brass work; also a receipt for cleaning silver gilt? They would be very useful as I have some old things I should like to clean.

Wood Carving.

Desirous asks—Where can wood carving models (plaster or soft wood) be procured; also where can I procure designs and tracings upon paper ready to be transferred, for carving?

Staining Glass.

Not too Old to Learn writes:—I want a cheap and simple method for staining glass, or to fix some colour on the surface of glass, so that it could be washed off if required. Would Judson's Dyes do with a little gum to thicken, and fix it on to glass? I have seen glass *coloured*, and apparently the colour had been applied in the same manner that photographers apply collodion.

Electromotor for Harmonium.

J. W. B. writes:—Information as to the application of an electromotor for blowing a large harmonium with two manuals, and independent pedals, will be gladly received. [I am sorry you have not had the information you require earlier, but there is often a difficulty in procuring and giving what is wanted, as promptly as I could wish.—Ed.]

Pine for Model Boat Building.

J. L. wants to know where he can purchase a piece of white American pine, without knot, split, or blemish, 2½ feet long, 1 foot wide, and 10 inches deep, from which to make a model boy's boat. J. L. cannot procure it in his town, of either wood merchant, joiner, or boat-builder.

Transferring Ordinary Engravings and Photos from Paper to Wood.

Jack Horner asks:—Would someone who has tried the above kindly inform me how it is done. I have seen views, etc., on the lids of small white wood boxes, and would like to ornament one in the same way, but cannot get any information on the subject.

Water Telescope.

T. W. (*Stoke-on-Trent*) writes:—I should like to have a description of the simplest means of making a water telescope to find articles lying at, or to inspect, the bottom of a lake from 4 to 6 feet deep.

BRIEF ANSWERS TO MINOR QUERIES.

J. B. (*Newcastle*).—The articles you mention will, I believe, be reproduced in book form, but it is impossible at the present time to attempt to name the price of the contemplated volume.

W. H. M. (*New Swindon*).—We have no work on the subject you mention, but think, as far as we can say without referring to them, that you will find the information you require in one of the large encyclopædias, such as the "Encyclopædia Britannica."

Selborne.—You letter to the publishers has been handed to me, as they are unable to reply to it by post, because you have omitted to append your name. The title page and index to each volume of Amateur Work is issued with the first part of the succeeding volume, because there is not sufficient time to get it ready for publication with the last part of the volume to which it belongs.

A. S.—Your remarks shall have due attention. With regard to "Lathe Construction," see the prospectus of the new volume, commencing with Part XXIV. You will find it in the advertising pages of this Part.

M. E. (*Anglet, Bayonne*).—Brief instructions on cutting and polishing pebbles were given in Part XIX. of Amateur Work, dated June, 1883. An Index to subjects treated in Vol. II., with a List of Illustrations, will be given with Part XXIV., the opening Part of the New Volume.

TITLE PAGE AND INDEX TO VOL. II.

The Title Page to Vol. II. of Amateur Work, Illustrated, with a full Index and List of Illustrations, will be given to Subscribers with Part XXIV.

GENERAL INDEX.

For Index to "Amateurs in Council," see next page.

INDEX TO AMATEURS IN COUNCIL.

INDEX TO ILLUSTRATIONS.

LIST OF FOLDING SUPPLEMENTS.